SURGERY, GYNECOLOGY AND OBSTETRICS

AN INTERNATIONAL MAGAZINE, PUBLISHED MONTHLY

VOLUME XIII DECEMBER, 1911 NUMBER 6

RAYNAUD'S DISEASE[1]

REPORT OF A CASE

BY ALEXANDER HUGH FERGUSON, M.D., CHICAGO, ILLINOIS

DEFINITION: RAYNAUD'S DISEASE SHOWS ITSELF IN THREE STAGES OR TYPES, CHIEFLY AFFECTING THE EXTREMITIES: 1. LOCAL SYNCOPE. 2. LOCAL ASPHYXIA. 3. LOCAL GANGRENE

HISTORY

THIS disease was first fully described by Raynaud in 1862 but Schrader in 1679 reported a case. Raynaud thought it arose from the gray matter of the spinal cord causing vasomotor constriction of the peripheral vessels. The tip of the nose, the cheeks, and lobes of the ears may be affected; although the hands and the feet are the parts most generally involved. It is rare for the trunk to be attacked, and when it is, it is in spots here and there manifesting the first, second, or even the third stages in the disease. Widespread gangrene of the skin has been mentioned. (Da Costa.)

Both sexes suffer from it, but it is more common in the female especially in those that are nervous. It has been observed in infants and in old people, but the young and the middle aged are most frequently the sufferers from the disease. Spontaneous recoveries have been observed, even after considerable destruction of the skin and extremities had taken place. Raynaud's disease is slow in its development and chronic in its course.

PATHOLOGY

Endarteritis obliterating the small arteries and thus causing various nutritive changes, such as blebs or cynotic areas, often leading to ulceration, sphacelation, and gangrene, is often the only pathologic change found. Neuritis may also be present.

Many theories have been advanced as to the origin of the pathologic changes that occur in Raynaud's disease. Strauss, for instance, maintains that the term symmetrical gangrene is incorrect, and that the term bilateral gangrene should be used instead. He believes the condition to be an angeoneurosis, rather than a trophoneurosis, and that it may develop independently of, as well as secondary to, some nervous affection. Guillan and Thaon declare that Raynaud's disease is not a pathologic entity at all, but a syndrome created by very different causes. Weber believes that the involuntary muscles of the skin press the sweat through the pores and compress the blood inward. The theory of Weiss that a diseased state of the venous tonus produces a spasm of the veins and a diminution of their lumen may be put forward in explanation of cases in which asphyxia is the first sign, no syncope preceding.

Many other theories are urged: (1) That it is a tabetic proceeding (Komfield). (2) That it is a hysteria or syringo-myelia (Hochenegg). (3) That it is a multiple neuritis (Pitres, Vaillard, and Mounstein). (4) That it is a spinal cord tumor (Calmann). (5) That it is an independent disease, as well as a symptom of other diseases (Oppemheim). (6) That it is a

[1] Read at a joint meeting of the Chicago Surgical Society and the Chicago Medical Society, May 10, 1911.

congestion dermatoses (Auspitz). (7) That it is a combination of vasomotor and trophic disturbances (Matanovitch).

Lannois and Porot report a case of gangrene of the extremities in an old woman suffering from erythromelalgia and arteriosclerosis. Autopsy disclosed degeneration of the left pyramidal tract of the spinal cord, with atrophy of the left half of the body. Schlesinger observed a case associated with erythromelalgia, in which the autopsy showed a sarcoma of the posterior spinal roots, compressing the spinal cord. The peripheral vessels were normal. Harold cites a case that appeared in a boy of four years; both hands and feet were affected. The former got well, the latter dropped off spontaneously. The organs were normal. No antecedent diseases.

Raynaud's disease is usually preceded by a long history of paræsthesia and attacks in which the affected parts become cold and either pale or cyanotic. Mental depression, sleeplessness, and disturbance of vision, audition and taste are not uncommon. Bullæ may form over an area which later becomes gangrenous. Sometimes a gradual mummification occurs, one or several fingers being involved. When the toes are affected the plantar surface is more involved than the dorsal.

SYMPTOMS AND SIGNS

Local syncope is one of the first signs. The fingers, the toes, the cheeks, etc., become cold and pale. When it affects the fingers it is commonly called "dead fingers." The disease is usually bilateral, but one finger or one toe or a small area of skin only may show the blanched and shriveled appearance, simulating that caused by severe cold. There is a numb feeling with loss of sensation and loss of the sense of pain. The local syncope is recurrent and paroxysmal in character lasting from several minutes to several hours, and may occur several times within twenty-four hours.

When the attack is over the part or parts manifesting the local syncopes return to the normal color and sensation. There is no motor paralysis but the fingers or the toes feel powerless, numb, and stiff and an unpleasant tingling sensation is present while the attack is on; but it is rare to have severe pain. The disease may terminate at this stage and the patient get entirely well.

After the local pallor subsides, the usual course is for local asphyxia to follow. This is a stage of reaction. The skin becomes dusky, red, purplish and sometimes almost black. The local syncope may be insignificant and the reaction very prominent. When the local asphyxia is marked, the surface of the skin is cold, tactile sense is impaired, and severe pain may be present. As in syncope, the attacks occur in cycles or at least are recurrent and paroxysmal. Strange to say, both syncope and asphyxia may disappear from one finger or one toe to another and reversely reappear. The disease may subside at this stage, usually, however, local gangrene follows this stage of asphyxia.

The gangrene may appear when the asphyxial stage is not very noticeable, and vice versa blebs appear on the skin that is asphyxiated; these break and reveal black spots, manifesting the local gangrene. After the patches of skin slough away, the ends of the fingers or toes are destroyed and spontaneous amputation of one, or all, of the fingers or toes may occur.

In the Medico-Chirurgical Transactions, Philadelphia, vol. 22, 1896, a case is reported in which a child, aged three years, lost both arms above the elbow, and the left leg above the knee. There was also local gangrene on the nose. Spontaneous amputation took place and the child recovered.

During this process of sphacelation and gangrene pain is often severe. When gangrene is about to occur, the parts are cold and somewhat enlarged. If the disease is in the foot, an ulcer is liable to form on the base of the foot where the pressure is most prominent in walking. As in my case when the ulcer becomes perforating and chronic in character, it may heal over after more or less destruction, only to recur again and do more damage not only to the soft parts but to the bone as well.

The disease may attack one limb more severely than another, and its bilateral nature on this account be overlooked by the patient. Sensation to heat and cold is more or less abolished and a sufferer may burn a hand or foot with but little inconvenience.

Many other objective and subjective symptoms have been noticed in this disease. Paroxysms may be so marked as to suspicion malaria (Barlow). But when thus marked chills and slight fever occur.

During an attack some patients become dim of vision and even ambyopia is occasionally seen. Loss of hearing, modification of taste and smell may ensue. The contraction and relaxation of the retinal vessels gave rise to eye symptoms (Galezwoski). Hemoglobinuria has also been observed during paroxysms, no doubt due to a local syncope of the kidney. Albumin is present in the urine.

Aphasia, hemiplegia, mental dullness, psychic manifestations, delusions, etc., may occur. Trophic changes of the joints, swelling, synovitis, thickening, and ankylosis have been observed. Before the nails drop off they may be altered and changed in shape, the skin hypertrophied, and the muscles atrophied.

ETIOLOGY

The cause of this disease is not yet settled. Congenital defects and disease both hereditary and acquired have been given as both active and predisposing causes. Congenitally small aorta, defects in the spinal cord, anæmia, exhaustion, chlorosis, syphilis, suppression of menses, emotional disturbances, shock, infections, contagions, malaria, diabetes, trauma, and rheumatism have been given as the chief contributing causes.

DIAGNOSIS

In the typical case the diagnosis is easy, but in the atypical, like mine, it is difficult.

In cases manifesting only one of the three types, syncope, asphyxia, or gangrene and their various modifications, one has to keep in mind the functional disturbances, drug effects, and actual diseases. The functional disturbances to be especially remembered are hysteria and allied conditions. The drug that causes blebs and local gangrene is ergot and its ingestion should be investigated.

Erythromelalgia resembles the asphyxial stage of Raynaud's disease. It is to be remembered that in erythromelalgia the affected limb or part is hot and not cold and is pulsating. Gangrene does not result in spite of these differences. Some authors claim that these two diseases are identical.

Gangrene from other causes is also to be differentiated.

(a) Gangrene in connection with diabetes.

(b) Gangrene after acute infections.

(c) Acute traumatic gangrene.

(d) Phagedenic gangrene.

(f) Cancrum and noma need only be mentioned.

It is important to bear in mind the *age* of the patient in the rhythmical and recurrent local syncope and asphyxia in Raynaud's. Lepra mutilans and senile gangrene must not be forgotten.

Gangrene due to Norven's disease. In this disease, syringomyelia or central gliomatosis is present. There is also peripheral neuritis or thickening of the cords. Muscular atrophy of the extremities is extreme, and possibly scoliosis or kyphosis is also present. The history is not that of recurrent paroxysms and the gangrenous *whitlows* are painless.

Gangrene due to injury of the nerves may be mistaken for Raynaud's disease. Injury to the nerves is followed by paralysis and anæsthesia. Gangrene from arterial embolism is usually caused by some other disease, endocarditis malignancy, or infection. A recent vasomotor gangrene has been called attention to by Barker, called acrocyanosis, in which there is an anæsthesia with gangrene of the toes. Gangrene from frost bites is important in cold climates.

Perforating ulcer in the ball of the foot occurs in tabes as well as in Raynaud's disease. The former is also rarely manifested; but spontaneous gangrene, the falling off of the nails, and falling out of the teeth is more common. The history, symptoms, and signs of tabes are sufficient to differentiate the latter from the former. As a rule, the perforating ulcer of tabes develops on the plantar surface of the foot, often the great toe, and may occur quite early in the disease and is very often symmetrical.

In endarteritis obliterans there are no paroxysms of syncope. In senile gangrene the patient is always old, and cardiac and vascular destruction is present, therefore no paroxysms of anæmia.

TREATMENT

The treatment is purely symptomatic. There is no drug, appliance, or rule of life or climate that is curative of Raynaud's disease. Warm weather is more favorable to recovery and adminstration of opiates is essential during the painful stage. It has been said that the hyperdermics of morphine excite to local gangrene. The administration of nitroglycerine and chloral gives temporary relief according to the condition. Diehle reports three cases relieved by electricity. In cases of amblyopia Raynaud used the galvanic current along the spinal column with beneficial results.

The stretching of the nerves, as done by De Bovis, is not to be recommended; although improvement had taken place in some of his cases, the treatment in the hands of others was deleterious. Palliative measures, such as warm baths, astringents, liniments, fomentations, etc., are at times very grateful and beneficial to the patient. The electric bath for the extremities taken daily for ten or fifteen minutes is recommended by Dr. Lewis Jones.

When ulcer and gangrene occur a feeble antiseptic must be employed and general surgical asepsis strictly adhered to, to prevent local and general infection. Septic conditions are, however, rare in Raynaud's disease.

Removal of the gangrenous spots and amputation of the different parts involved is necessary, and occasionally amputation of the entire foot is indicated, as in our case.

CASE. Maude L., age 21, unmarried. Secretary to her father. Father living, 42 years of age, married 22 years. Suffered from German measles seven or eight years ago. Is subject to tonsillitis. Denies all luetic taint and possibility of acquiring it. The paternal grandfather suffered from some traumatism of one leg. It would not heal and ultimately caused his death. There was an indefinite history of injury two years before death.

Mother living, 43 years of age, healthy and clear family history. Had no miscarriages, all children living. Four of the children, besides the patient, in family are apparently healthy. All attending school except the youngest. Except for this indefinite trouble in the paternal grandfather, about which little could be obtained, the family history appears to be without special note.

Patient is the oldest child, was born at full term with the aid of instruments. No immediate trouble after birth. Walked and talked properly at the usual time. Suffered from no disease before two years of age, then began to notice, and even to a slight degree from the first walking, that she swung the left leg outward a little. The knee on this side seemed to be stiff. No pains were complained of, however. The foot was normal and apparently well developed. When about three years of age, a small sore appeared on the point of the small toe of the left foot. It healed up in a short time and left a scar at the point of the toe. The trouble seemed to pass from one toe to another. Pains of a sharp character would be complained of just before the breaking of the skin and the appearance of ulceration. No pain or trouble ever occurred in the other leg. Sought medical advice, and tentative opinion was given that there was pressure from a cicatrix in the spinal cord. Incontinence of urine was troublesome until 10 or 11 years of age. No other symptoms of disease. No line of demarcation appeared in the limb. No marked cyanosis, yet these sores continued to appear followed by perforating ulcers in the toes and the sole of the foot, with loss of bone.

Menstruation began at the age of 14 years and has always been normal. No history of any unusual urinary findings or bowel trouble. No discoverable deformity anywhere in the spine. No symptoms of any sort in or about the body. No symptoms of any sort in connection with the head, arms, or right leg, except that the right leg seems in a general way less developed than one might expect.

Knee jerks absent, sensation normal, muscular powers normal. These sores at the end of the left foot involving the toes with ulcerations and broken down tissue have appeared, in all, some five or six times, so that now there are no normal toes left. At present, near the middle of the sole and forward part of the left foot, the tissue is broken down into an ulcer as far as the muscular tissue, measuring in diameter about one inch and a half to two inches and limited by sharp well defined but undermined edges. The base is gray and leathery in character. It is distinctly an atrophic ulcer and has lasted off and on for 19 years, resisting every known means of healing. At one time it healed for two years. The girl's weight is 98 pounds, height about five feet.

The diagnosis apparently lies between some obscure form of central lesion involving the trophic centers of the spinal cord, or an asymmetrical type of Raynaud's disease. In the absence of more definite data, I am inclined to think that it is an irregular type of Raynaud's disease.

In walking the heel did not touch the ground. She walked on the ball of her foot and wore a specially constructed shoe. Sensation to pain and heat and cold were deficient up as far as the ankle joint. She had frequently burned her toes without her knowledge. Both her feet were very sensitive to cold and on this account she took extra precautions to keep her feet warm. The toes on the right foot are stubby and shorter than normal.

Operation November 15, 1910, at St. Luke's Hospital. Ether anæsthesia. Amputation at junction

of lower and middle third of leg. Esmarch constrictor applied after usual preparation.

The anterior and posterior skin flaps were equal — tissues divided to bones — vessels caught and ligated — nerves pulled down and cut short — tibia and fibula sawed through (the latter three-fourths of an inch shorter) periosteum flap made previous to dividing tibia and raised with muscular structures and later brought over sawed end of tibia. Then soft tissue (flaps) were brought together and the skin closed by interrupted horsehair and silkworm sutures (two or three retention sutures). A wick of silkworm gut was used for drainage.

Immediately after the skin was closed a rubber glove was placed on the stump (the glove fingers ligated and removed) and over this a mold of plaster of Paris was made for the purpose of making a suitably fitting artificial limb without delay. After the plaster of Paris mold was removed, the stump was dressed in the usual manner (dry dressing and thymol di-iodid Aristol powder). A starch cast strengthened with strips of wire mesh was also used.

AFTER TREATMENT

Moderate elevation of limb on pillow for four days. Fifth day patient allowed to move about in bed. Eighth day allowed to sit up in chair. First dressing done on tenth day; the silkworm gut strands were all removed. Wound healed by primary union. The stump was never painful.

The artificial limb was fitted on the twenty-fourth day after operation; on the twenty-seventh day the patient was about using the artificial limb. On the thirty-fourth day she left the hospital.

The patient's recovery was entirely uneventful; no temperature, no loss of appetite, no weakness. Blood and urine negative at all times.

I am indebted to Dr. L. H. Mettler for the report of this case, to Dr. E. R. Le Count for the pathologic report, and to Dr. Jas. J. Monahan for the report of after treatment.

PATHOLOGIC REPORT

This is the left foot. The tibia and fibula have been cut across in amputating the foot 12 cm. above the internal and external malleoli respectively. The metatarsal bones are apparently absent. The foot is shortened by the absence of the anterior one-third. The heel and the proximal two-thirds are fairly well formed and developed. The length of the sole is 14.5 cm. The anterior end of the foot in the place where the toes should be is the seat of five small elevations marking the site of the former toes. The most prominent of these is the fourth toe. This is about the size of a woman's fifth toe and this toe has a nail the free margin of which is very much thickened and black, with the appearance of having been rolled together. The first and fifth toes are represented by very slight projections. The second and third are slightly larger projections, the third larger than the second. Both of these are compressed and obliquely diverted internally. On the sole of the

foot there is an ulcer located near the external border and well in front. The most distal edge of the ulcer is 2 cm. from the plantar furrow of the fourth toe. The ulcer is 3.5 cm. long and 1.5 to 2.5 cm. wide, its long axis obliquely directed so that its distal end is more internal than its proximal end. This ulcer is in the middle of the surface of the foot, which on this side apparently bore the weight of the body. This surface is 7.5 cm. by 5.5 cm. in size. It is the region of the sole which in a normally developed foot would be directly beneath the tarsometatarsal joints of the outer three toes. In consequence of this part of the sole of the foot having borne the weight of the body on this side the tibia and fibula form an angle with the long axis of the foot which is different from that in the normally developed individual, they are directed backward and inward. The deflection backward is about 20° more than normally and the deflection inward is almost as great. The ulcer is 5 mm. deep. It has a flat even floor which is grayish red and covered apparently by normal healthy granulation tissue.

MICROSCOPIC EXAMINATION

In microscopic preparations made from the anterior and posterior tibial, the peroneal, the dorsalis pedis, and the external and internal plantar arteries and the accompanying veins and nerves there are no alterations except in the arteries. The change is an endarteritis with beginning lime deposition of the inner portion of the tunica media. The thickening of the intima is not uniform. There are elevations into the channel which occupy one-sixth to one-third of its circumference and are half as thick as the circular muscular coat. The thickening is all internal to the elastic lamina. The foregoing represent probably a maximum change. In other sections the endarteritis is characterized by more uniform thickening. The tissue inside the inner elastic layer posesses quite evenly dispersed cells with stellate and spindle shaped nuclei. Between these cells there are fibers some of which are elastic tissue. In no place, however, are they gathered together to form masses which might readily be confused with the inner elastic lamina. These conditions are present in sections made from many segments of the vessels.

Anatomic diagnosis: Spontaneous amputation of the toes from endarteritis.

VOLVULUS[1]

By ERNEST PENDLETON MAGRUDER, A. M., M. D., Washington, D. C.
Clinical Professor of Surgery, Georgetown University; Associate Surgeon, Emergency Hospital

VOLVULUS may be defined as the twisting or turning or rotation or knotting of a portion of the bowel about its axis, with resultant fecal and circulatory current obstruction, partial or complete.

According to Rokitanski the possible anatomic findings are as follows:

1. A loop may undergo occlusion by making a half or a whole turn about its longitudinal axis.

2. The entire mesentery, or a section of it, may rotate with its associated bowel loop a half or several times about its axis. This results in rotation about the mesenteric axis.

3. A loop of bowel with its mesentery may constitute the axis about which another loop with its mesentery may be turned.

ETIOLOGY

Volvulus is apparently the result of mesenteric elongation from frequent strain, hence more common in the old than in the young. It is more frequent in men than in women. It is rare under forty years of age. It is seldom seen in the small intestine even in the presence of adhesions. Cases are occasional in children with congenital lengthening of the mesentery. It is rarely the cause of acute obstruction. Appendicitis may be followed by volvulus as a sequence to adhesions over inflamed areas. In "A Study of One Thousand Operations for Acute Intestinal Obstruction and Gangrenous Hernia" Gibson found twelve per cent due to volvulus. Three to four per cent of intestinal obstructions are credited to volvulus. Perhaps the percentage should be larger. Sometimes symptoms extend over a number of years. Bloodgood reports in one of his cases thirty-two attacks in sixteen years.

Etiological factors are: (1) constipation; (2) long mesentery; (3) approximation of the footpoints of the loop; (4) adhesions; (5) age, forty to sixty; (6) sex, male in eighty per cent. In the sigmoid variety, the flexure overloaded with feces and gas elongates the mesentery of its pelvic portion and favors twisting, more liable still if the footpoints of the loop are approximated. The more powerful strain at stool of the male may account for the larger proportion of cases in this sex, rather than any anatomic differences in length between the male and female mesenteries of the pelvic sigmoid. The mesentery may be narrowed and contracted following inflammation of its lymphatic glands, or other forms of inflammation affecting the mesentery. Elongation of the mesentery may follow a rapid loss of fat either in the abdominal wall or mesentery, as observed in multiparæ. The twist may be occasioned by a foreign body within the bowel. A carcinoma of the intestines may induce volvulus. The sigmoid flexure has a long mesocolon with a short attachment to the posterior abdominal wall, so that it readily twists about the axis of the mesentery. Hence it is the most common site of volvulus. The twist may follow external violence, such as a fall or jar, or may result from a bowel overdistended with feces. Von Samson showed that in a normal sigmoid a twist of 180 degrees will not produce strangulation. Symptoms begin at 270 degrees and become more and more marked as the twist approaches 360 degrees or more.

The small intestine is predisposed to volvulus when its mesentery is of abnormal length, or the mesenteric attachment to the posterior abdominal wall is short. This may be congenital or secondary to peritonitis or the fixation of a loop in a hernial sac. Gibson cites one hundred and twenty-one cases of volvulus of which seventy-three were in the colon, fifty-eight in the sigmoid flexure, fifteen elsewhere in the colon, and thirty-six, or less than one-third in the small intestine. In 1900 Gibson stated that Riedel's case of volvulus of the small intestine with resection was the only successful one on record. Fitz cites thirty-four cases and states that the largest number in any decade was that between the

[1] Read before the Washington Surgical Society, May 19, 1911.

thirtieth and fortieth year. In Gibson's cases the average age was 45 years. In an excellent article entitled "Volvulus of the Small Intestine, etc." American Journal of the Medical Sciences, May, 1903, Vaughan records sixty-one collected cases including his own. Of these forty were partial, involving a portion of the mesentery and small intestine; in twenty-one the entire mesentery was involved in the twist.

PATHOLOGICAL ANATOMY

With the twisting of the intestine the blood-vessels are compressed, and intense venous engorgement ensues. The obstructed bowel rapidly distends with fermentative and carbonic acid gases, unabsorbed because of the stasis of the circulation. The color of the intestine changes from pinkish to dark red, to purple, to black; its walls are edematous; blood extravasates into the lumen of the bowel and into the cavity of the peritoneum; finally gangrene supervenes; the sigmoid may be so distended as to fill the entire abdomen, or a loop of small intestine resemble an enlarged colon. Rupture may take place, usually above the strangulation. The striæ cannot be recognized. Bacterial invasion through the distended and edematous walls effects an early peritonitis.

The site of the twist while most frequent in the sigmoid may be at the ileo-cecal valve or in any portion of the small intestine. In sigmoid twist the rectum is usually rotated posteriorly to the descending colon; sometimes anteriorly, the rectum lying in front. The small intestine may be caught in the rotated sigmoid; as may also the pedicle of the pelvic or abdominal tumor. The small intestine may pass under a band or through an internal hernial orifice, becoming twisted upon itself after incarceration at the point of engagement.

SYMPTOMS

These vary according to site of lesion. If it is in the sigmoid, sudden, severe pain of the crampy or colicky type and absolute constipation is the rule, or a mucous discharge with tenesmus as a variation. So low a strangulation may produce no vomiting. Shortly now the abdomen is exquisitely tender, bulging with distension, the diaphragm is displaced upward with respiratory and circulatory interference. Within 24 or 48 hours peritonitis is superimposed, with increased tenderness, swelling, and prostration.

If the twist be in the upper portion of the small intestine vomiting is more conspicuous. Here a localized tumefaction may simulate a fibroid mass. The most striking symptoms are abdominal pain and vomiting, first of the stomach contents, then bile-stained fluid, later of a fecal character. In partial obstruction, vomiting is absent or comes on late. If the obstruction is high in the small intestine, it occurs very early; if in the colon, especially of the sigmoid, it comes on late or may be entirely absent. There is distension of the bowel and abdomen from fermentative and putrefactive changes in its contents above the point of obstruction. Frequent and painful hiccough may ensue. Progressive prostration usually ends in death from collapse after one or several days. We should add progressive cardiac enfeeblement, with sometimes pyrexia, sometimes none, sometimes subnormal temperature, according to conditions. Also oliguria, in part because of fluid loss by vomiting, in part because of failure of the intestine to absorb fluid, in part because of decreased arterial tension. In the presence of a diffused peritonitis following obstruction of the ileum abundant indican is found, the result of absorption of the putrid decomposition products of albumen. In involvement of the large intestine indican may be but slightly increased or absent. The features are anxious; the face pale, pinched; the eyes sunken; skin clammy; extremities cool, often cyanotic.

DIFFERENTIAL DIAGNOSIS

The clinical course of the disease may point to the condition. Gall-stone is a common cause of obstruction, which is accompanied with vomiting and prostration of great severity if the biliary calculus has entered and occluded the duodenum. Dislodgment may give relief, otherwise, early fecal vomiting and collapse follow. There is, however, usually a previous history of gall-stone and jaundice. In acute obstruction, we think of the lodgment of foreign bodies, adhesive band compressions, internal herniæ, intussusception,

volvulus. In chronic intestinal obstruction we think of stricture or stenosis, cancerous growths, fecal accumulation, compression from ptoses of organs, pelvic or abdominal tumors. Whether internal hernia or adhesive band obstructions, both usually involving the small intestine, it is difficult to determine. Intussusception is common in the ileum or at the ileocecal valve and is a condition of childhood and early adult life rather than mature years. The onset is less acute, there is a local sausage-shaped tumefaction and characteristic stools. Volvulus on the other hand is common in the aged.

In partial obstructions and strictures the attack of abdominal distension is relieved by removal of the flatus, but are uncertain of recognition.

Tumors, carcinomatous and otherwise, are usual in the lower bowel, discovered on abdominal palpation, or if low down disclosed by the rectal or enteroscopic examination. The presence of mucous, mucopurulent, blood-streaked or bloody passages, may come to our aid. These are common in carcinomatous obstruction. The age, the gradual onset, the cachexia, are of material advantage, for diagnosis.

In this connection, we must not overlook the clinical features presented by occasional diverticula, congenital or acquired, inflammatory or obstructive. Samson found acquired diverticula 64 times in 8,132 autopsies at the Dresden Hospital.

Fecal accumulation obstruction is rarely seen independent of other causes. In the case of retained fecal masses producing catarrhal inflammation of the bowel and a continuous diarrhœa, the condition is very misleading.

Perhaps the first question the surgeon asks himself is: Are the symptoms those of intestinal paralysis from peritonitis or those of mechanical obstruction? True, both may co-exist, but in the one peritonitis will have caused the paralysis, obstruction is the last act. In the other, obstructive symptoms precede, peritonitis is the final scene. In localized peritonitis, the paralysis is likewise local and rarely absolute. Peristaltic movements continue, distension may not be noticeable.

If it be of the diffused purulent type, however, whether purulent, fibrino-purulent or putrid in character, there is no peristaltis, but marked distension, complete paralysis. If the intestine is strangulated that loop rapidly distends, its movement ceases, it remains at a fixed point. A sero-sanguinolent transudate accumulates in the peritoneum and reveals a dull percussion note in the flanks. The efferent bowel empties itself and remains empty. The afferent coils may or may not become distended before operation, but the tendency is toward a progressive distension above the point of obstruction. A like picture presents in obturation. But the afferent coil is more actively peristaltic. If the case be one of diffuse peritonitis, pyrexia may or may not be present. In diffused purulent peritonitis it is commonly found. But the degree of fever is by no means indicative of the degree of sepsis. When present it signifies peritonitis rather than mechanical obstruction without complication. The picture of diffuse peritonitis is one of hollow eyes, anxious expression, pale, pinched, sunken countenance; an abdomen of marked but uniform distension; no sectional coils are visible upon the surface; the knee may be flexed upon the thigh, the thigh upon the abdomen; thirst; vomiting, progressively fecal; oliguria; continuous abdominal pain; restlessness; tenderness and rigidity over the abdomen; rapid costal breathing; dyspnœa; rapid, feeble, compressible pulse. If the attack is sudden — perhaps there have been several attacks — with abdominal pain, first general and then localized in the right iliac fossa, it points to the appendix. If the history is one of chronic gastritis, it points to gastric or duodenal ulcer. If of jaundice and pain at the ninth right costal margin, it points to gall-stone and perforation. If of continuous fever for days or weeks with diarrhœa and prostration, it points to a typhoid perforation. If of menstrual disturbances with pelvic pain and endometritis, it points to pelvic peritonitis. If in the left lower quadrant, there is a localized tympany spreading upward into the right, later becoming general, it is probably volvulus of the sigmoid. The marked rigidity and tenderness characteristic of peritoneal inflammation may yet be absent. In the strangulated coil, peristaltic

movement cannot be elicited either by palpation or auscultation.

The examination should not neglect the seats of external herniæ, nor should one fail to make rectal palpation in both sexes nor the vaginal in the female.

If the sigmoid is twisted one quart of water is the limited capacity of the gut below it. If several quarts may be gently injected, therefore, we exclude volvulus of the sigmoid. It may be in the small intestine, or, in any event, above the sigmoid.

The sudden, sharp, severe and continuous pain of strangulation is intermittent and paroxysmal in obstruction by obturation. The afferent bowel forcefully contracts in the attempt to overcome the obstruction. Vomiting is late rather than early. In strangulation, the obstruction is usually complete at once; in obturation it is progressively complete. Usually there is the history of a foreign body swallowed, or of gall-stone disease, more common than enteroliths. Other than those of carcinomatous growth, obturation by tumors is rare. Those of benign growth are lipoma, fibroma, or myoma. We should be mindful of the tuberculous cecum, also, of the pelvic tumor, uterine, or ovarian, or a pelvic, or retroperitoneal growth. A carcinoma or stricture of the rectum will not escape the palpating finger. If the history is of constipation, on the one hand, or of constipation and attending diarrhœa on the other, with accompanying mucous discharge, blood-tinged, we distinguish fecal impaction from carcinoma of the colon. In infants and children intestinal obstruction is usually due to intussusception or to tubercular peritonitis. Finally, we must bear in mind obstruction from internal herniæ, such as that seen in the fossa duodenojejunalis or fossa of Treitz, that of the intersigmoid, the pericecal, the properitoneal, the interstitial, that through the foramen of Winslow into the lesser sac, and the diaphragmatic. Of these that involving the fossa of Treitz is most common. While such herniæ are rarely diagnosticated previous to operation, one should bear them in mind for quick exploration of their sites as soon as the abdomen has been opened and the more common lesions are absent.

PROGNOSIS

In the absence of the occasional spontaneous relief, the prognosis is very grave, unless prompt surgical intervention forestalls peritonitis, gangrene, and speedy death.

TREATMENT

Early in the condition, in the absence of an absolute diagnosis of obstruction and before surgical intervention is advisable, medicinal measures are indicated in cases of partial obstruction or of fecal impaction or of foreign bodies within the bowel. It is well to institute complete rest; no diet whatever. Rectal and hypodermic injections of normal saline solution will control thirst. A partial sigmoid volvulus may often be relieved by enemata in the knee chest position. Laxatives, except in fecal impaction and partial occlusion, should be condemned, for peristalsis will increase the dangers of an abdominal condition. When used, the salines or small doses of calomel, producing a serous outpouring without stimulating active peristalsis, are to be preferred. Warm saline or oil enemata and colonic flushings may break up an impaction that threatens complete obstruction. The injections should not be forceful but continuously and gently given, otherwise violent peristalsis above the obstruction follows. The old method of bowel inflation with atmospheric air has likewise been properly abandoned. Contrary to a common practice, opium, whether administered hypodermatically, by mouth, or by rectum, should be strongly condemned. For gastric disturbances, nausea, and vomiting, Kussmaul's recommendation of gastric lavage is particularly helpful. But in no case should these medicinal measures be persisted in longer than a day, perhaps better for only a few hours. Far better to err on the side of too early rather than too late surgical procedure. When in doubt, surgical intervention should be immediately adopted.

As the special purpose of this paper is to emphasize a few points in surgical treatment, operative and postoperative, permit me to cite a case in question:

L. C., female, aged 25, occupation domestic, single. Family and previous histories negative, except that she had long been a sufferer from consti-

pation. Present illness: On February 11th, she was seized with sudden, severe, crampy pains over the epigastrium, necessitating her going to bed. The physician called did not consider the case serious, taking it for gastric indigestion. She was given a purgative but the bowel did not move. On the 12th, the condition was worse, and morphine was administered for pain. On the 13th, a consultant was called in and the diagnosis of appendicitis agreed upon. On the afternoon of the 13th, the patient was sent to the Emergency Hospital and carried immediately to the operating room. A leucocyte count, made at once, read: 24,200 to the cm.; respirations were 30; pulse 140; temperature 101°. The pulse reached 170 on the table. A gridiron opening at McBurney's point was made to the peritoneum, through which could readily be seen the darkened intestines under great pressure. That the condition was one of intestinal obstruction was now patent. The incision was at once extended and the abdomen opened. A large quantity of sero-sanguineous fluid, of obnoxious odor, escaped. The ballooned bowel, quite black in color, was adherent to the parietal peritoneum; there was a general peritonitis, with abundant fibrin flakes. Only the adhesions about the mass were released. The mass was brought out upon the abdomen, guarded by gauze and wrapped in towels wrung out of hot salt solution. Volvulus of the ileum, consisting of bowel and its mesentery rotated one and a half times around, the twist located at a point five inches above the ileocecal valve was the lesion found. A section, a trifle more than two feet, of the gut was resected, an end to end anastomosis made, consisting of two tiers of Edinburgh thread Lembert stitches, the second inverting the first, and the whole reinforced by five stay sutures around the gut. This last was merely precautionary to prevent any strain upon the knuckle when replaced into the abdomen through the gridiron opening. Had the diagnosis been correct and the more proper right rectus or median incision made, the stay stitches had been unnecessary. Three half-inch-in-diameter rubber tubes wrapped with gauze and protected by gutta percha tissue over all, were placed to drain the cul-de-sac, right and left iliac fossæ. The operation was completed as quickly as the circumstances would allow. A proctoclysis of a quart of fluid, half normal saline, half black coffee, was injected into the rectum to be retained as soon as the patient reached the ward, where she was placed in the Fowler position, followed in an hour by the continuous saline solution per rectum. No diet for three days; nutrient enemata after six P. M. the following day. Opium in any form was prohibited. Digitalin, grain $\frac{1}{12}$, by hypodermic, was given every four hours to slow the pulse. The second day after the operation eserine sulphate, gr. $\frac{1}{30}$, was administered hypodermatically, and at the same time, four ounces of castor oil in lemon juice given by mouth. This produced a large movement of the bowel in three hours. Liquid diet was then instituted, milk and cocoa being at first excluded. The drainage was unusually abundant, the wound was dressed twice daily. The first tube, that from the left iliac fossa, was removed on the 15th, the second, that from the right iliac fossa, on the 16th, the third, that from the cul-de-sac, on the 18th. On the 19th, the temperature, pulse, and respiration were practically normal and the patient made an uneventful recovery. A blood examination was made daily. The white cell count fell from 24,200 just before operation, to 19,400, 16,000, 12,800, 11,600, 9,400, 7,600, in the successive days.

The writer would like to state that in his opinion, the postoperative treatment of these cases is of equal importance with the operative. No one will underrate the necessity for an impervious knuckle, the nice and exact coaptation of the parts in an end-to-end anastomosis, one that will not leak; no one will question the use of abundant drainage; abundant salt solution per rectum, and by hypodermoclysis if necessary in the beginning, but when and how shall we prevent a copræmia superimposing itself upon an already existing toxæmia and restore tonus to the paralytic ileus at the earliest possible hour consistent with safety? Before medication by mouth is advisable, a stimulating rectal enema made of alum — a table-spoonful to a quart of warm water — or double normal strength salt solution or magnesium sulphate and glycerine and water in equal parts — may be confidently recommended. Thirty-six hours after operation, when medication by mouth may be risked, the writer knows of nothing as good as castor oil given in ounce doses, repeated at half hour intervals to effect, or in two, four, and even six ounce doses when speedy effect is imperative, with lemon juice or sarsaparilla for pleasant vehicle. *Opium in any form until the bowel has moved after the operation should be absolutely condemned.* For depression and lowered blood pressure, digitalin, hypodermatically, gr. $\frac{1}{120}$, every four hours, is most excellent. For tympanites and meteorism, the rectal tube placed high and left in position for lavage of the bowel; no food whatever by mouth until after the bowel moves. At this time the digitalin by hypodermic may be changed to fluid extract or tincture of digitalis by mouth. A modified Fowler position, a change from the sitting to an angle of 45 degrees or less, is preferable after twelve hours. It is in every

way less exhausting to the patient and does not materially interfere with drainage. In some cases, the Trendelenburg position drains better than the Fowler. Redressing should be done every twelve hours during the first two or three days. The writer knows of nothing more efficacious in assisting capillary drainage than abundant, moist dressing gauze wrung out of one-half of one per cent warm tincture of iodine solution. It is infinitely better than the dry dressing.

What now should we emphasize? The earliest diagnosis and the earliest operation possible thereafter if there is the slightest chance to save life; careful and rapid technique; resection — always if the bowel is gangrenous—and an end-to-end anastomosis. In milder cases the gut is simply entered in the opposite direction to the volvulus. Other things being equal, the quickest work is the best, but to make the knuckle leak-proof is worthy of any man's time and of paramount importance. The frequent association of volvulus with strangulated hernia should always be borne in mind and the coil pulled down and examined or the abdomen opened when in doubt. Further advisable is the removal of the extravasation by gentle, moist sponging if possible; by normal saline or 1 to 10,000 silver nitrate irrigation if necessary; abundant drainage, preferably from the *three* points, *cul-de-sac, right, and left iliac fossæ*; rectal injections of normal salt solution, intermittently, four to eight ounces at a time every two hours or continuously, forty drops per minute; bowel movement at the end of the 36th hour induced by mouth medication, preferably by castor oil, and all food and liquids by mouth restricted until then; the bromides for sedatives; the Fowler position, modified to the more and more acute angle and gradually assuming the horizontal position, or alternating the modified Fowler with the Trendelenburg position; *the absolute interdiction of opium in any form until postoperative bowel movement.* The writer believes it intensifies an already existing ileus, makes a bad thing worse, and causes many a death which might otherwise be saved.

NOTE.—I am very much indebted to Dr. George Tully Vaughan for this patient.

ACCIDENTS AND DEATHS FROM EXPLORATORY PUNCTURE OF THE PLEURA[1]

BY HUGHES DAYTON, M. D., NEW YORK CITY, NEW YORK
Associate Attending Physician, New York Hospital
(From the Medical Division of the New York Hospital)

THE dangers of aspiration of pleural effusions and of irrigation of empyemas, and the occurrence of sudden death without apparent cause in cases of pleurisy with effusion, have been frequently discussed and are fairly well recognized. The accidents and fatalities resulting from attempts to perform simple exploratory puncture of the pleura have received much less recognition by medical writers, the vast majority of whom declare it to be a perfectly safe procedure if done aseptically. A few such occurrences which have come under my personal observation have furnished the incentive for the present study of this subject, which includes a review of the available records of serious and fatal accidents resulting from exploratory puncture of the pleura, and the report of a number of cases not previously published. These have been gathered from the histories of approximately twenty thousand patients admitted to the Medical Division of the New York Hospital from January 1, 1899, to July 1, 1911. In their compilation I have been aided by twenty-two of the twenty-four house physicians whose periods of service have covered these twelve years.

The small number of accidents directly

[1] Read at a meeting of the New York Academy of Medicine, Section on Medicine, October 17, 1911

referable to exploratory puncture is evidenced by the relative paucity of those which have occurred in these twenty thousand cases, when one considers the frequency of its performance in a hospital whose patients include a large proportion of pulmonary, cardiac, and nephritic cases. This is emphasized by the fact that in the first two thousand of these patients exploratory puncture was performed one or more times in 182, or 9.1 per cent of the total medical admissions. To this over thorough period of exploration I am indebted, however, for only two of the cases reported. The more serious accidents have occurred within recent years, though the tendency has been to restrict exploratory puncture. It is now done comparatively infrequently, and only when it is likely to yield definite therapeutic indications. As the dangers attending aspiration of pleural effusions have been so frequently discussed, and as this procedure introduces the factor of alteration of intrathoracic pressure with the resultant dislodgment of thrombi causing pulmonary or cerebral embolism, disturbance of circulatory equilibrium, pulmonary edema, albuminous expectoration, laceration of diseased lung with rupture of abscesses, leading to pyopneumothorax, etc., the consideration of aspiration of such effusions will be rigidly excluded. Many of the accidents and deaths resulting from aspiration of pleural effusions doubtless depend, however, upon the factors involved in simple exploratory puncture, though the presence of fluid in the pleural cavity renders less likely the occurrence of those which are due to injury of the lung or visceral pleura. I have also excluded several deaths shortly following exploratory puncture in patients admitted in the last stages of cardiac failure whose dyspnœa and physical signs suggested the advisability of aspiration to relieve intrathoracic pressure, and whose death did not seem hastened by the puncture.

Accidents which may result from exploratory puncture include:

1. Breaking the needle. One case, with no known sequelæ, is included in this series. This accident may give rise to circumscribed pleurisy as in a case recorded by H. M. Biggs (1).

2. Localized pleurisy may result from the traumatism of puncture.

3. Subcutaneous emphysema is not uncommon after exploratory puncture, either occurring alone or complicating puncture of a pre-existing pneumothorax or one caused by the exploratory puncture. It seems to be most common in cases in which puncture has failed to obtain fluid or in which solid lung or an adherent pleura has been pierced; for example, J. C. Gittings' (2) three cases, all dry taps, one of which was accompanied by pneumothorax, two being cases of pneumonia, and one of tuberculosis or dry pleurisy; and G. G. Sears' (3) case, a boy of four, punctured for differential diagnosis between solidified lung and pleural effusion, in which only a small amount of blood was obtained and coughing was immediately followed by progressive emphysema, these two symptoms showing puncture of a lung probably adherent to chest wall.

Subcutaneous emphysema resulting from exploratory puncture may be localized around the site of puncture, as in case 1 (vide infra), or become diffuse as in cases 2 and 3, or general. It may cause no discomfort and be recognized only by the sensation of crepitus and perhaps a slight puffiness of the affected area, or may be so marked and extensive as to present an alarming appearance. In some cases it causes tenderness and even pain, as in case 3, but these usually subside rapidly and absorption of the air occurs without other symptoms. Perrin (4) quotes Galliard as stating that subcutaneous emphysema following puncture of a pneumothorax may be a serious complication, as it may become general and require incision, or cellulitis may be set up if pleurisy is present. Two cases of Perrin show that it may be tolerated, and is sometimes useful, acting as a safety valve by which the air is carried to the subcutaneous tissues where it is absorbed much more rapidly than from the pleural cavity.

Among the New York hospital cases slight, localized subcutaneous emphysema has been not uncommon, but its results have been insignificant. Case 1 illustrates briefly the history and benignity of this accident.

CASE 1. Dry pleurisy; subcutaneous emphysema after exploratory puncture. No. 20830, a salesman,

20 years of age, was admitted on December 6, 1910. He was suffering from hæmaturia, not definitely proved to be due to renal tuberculosis, with signs at first interpreted as those of fluid at the base of the left chest, but subsequently decided to be those of fibrinous pleurisy, as two punctures yielded no fluid. The day after the puncture subcutaneous emphysema around the site of puncture was noted. There were no sequelæ.

Cases 2 and 3 are illustrative of the more severe type of subcutaneous emphysema without and with subjective symptoms.

CASE 2. Acute lobar pneumonia; subcutaneous emphysema following exploratory puncture. No. 18303, a girl of three years, was admitted on May 4, 1909, with typical lobar pneumonia beginning three days before admission and involving the right lower lobe. From the angle of the left scapula to the base was an area of dullness with few râles and bronchial breathing which was supposed to be transmitted from the right side. Defervescence occurred by crisis on May 9th, the eighth day. On the fifteenth day the afternoon temperature began to rise gradually, reaching 105°, with respiration 48 and pulse 160, on the nineteenth day, and with 22,000 leucocytes, of which 83 per cent were polymorphonuclears, a large furuncle on the scalp and a profuse purulent nasal discharge. There were dullness and diminished breath and voice sounds at both bases, higher on the left. Puncture of the left chest posteriorly yielded no fluid, but well marked subcutaneous emphysema appeared around the site of puncture and extended over both sides of the chest, back and front. It apparently caused no pain or tenderness and had disappeared at the time of discharge, nine days later, when the lungs were practically clear.

CASE 3. Acute lobar pneumonia; pulmonary tuberculosis; pericarditis; subcutaneous emphysema following exploratory puncture. No. 16369, a widow, 33 years of age, a domestic servant, was admitted December 27, 1907. Fifteen years before admission she had had a cough for ten months with night sweats and loss of weight. Six years before she had suffered with pain in the right shoulder and chest, and had coughed at that time. Two years later an attack of arthritis involved the ankles. Three days before admission she had sudden onset of pain in the chest and cough with white and yellow sputum. Examination revealed consolidation of the left lower lobe, which subsequently disappeared. Signs of consolidation of the upper part of the left lung were recorded three days after admission and two days later pericardial friction was observed, the initial high temperature which accompanied the pneumonia gradually becoming continuous but with marked morning remissions. Tubercle bacilli were not found in the sputum until March 8th. Dullness and bronchial breathing persisted at the left apex and on January 22d an exploratory puncture was made near the left anterior axillary line. No fluid was obtained. On January 23d there was marked subcutaneous emphysema extending over the left side of the back, the left axilla, along the left arm to the elbow, and over the left breast to the costal margin, with pain and tenderness. In the midclavicular line at about the costal margin was a reddened area about two inches square which was tender and painful and gave a sense of fluctuation; but a small hypodermic needle inserted into this revealed nothing. After two days the pain in the emphysematous area had ceased and on February 14th the absence of emphysema was noted.

4. Pneumothorax, an accident which may result from exploratory puncture of the pleura, is of more serious import than subcutaneous emphysema. It seems to follow aspiration much more frequently than simple exploration. No cases resulting from the latter are found in our series. That pneumothorax is not always a serious complication is shown by J. P. Parkinson's (5) report of three cases, in all of which it was limited in extent, caused no great distress and no bad symptoms, and ended with rapid resorption of the air, and by Sears' (6) case in which it is referred to as probably only hastening death from pneumonia. Goodhart and Still (7), on the other hand, refer to an instance of puncture immediately followed by signs of pneumothorax with increase of respiratory difficulty which proved fatal. In a case mentioned by Packard (8) exploratory puncture caused sudden pneumothorax, profound shock, and early death. The needle was found to have perforated an emphysematous bleb of the lung. Biggs (1) reports three fatal cases of pneumothorax from exploratory puncture. In one, puncture of the right chest yielded a few drops of pus and blood, that of the left, nothing. Next morning the patient was found dead in bed. The autopsy showed extensive pneumonitis with tuberculosis in the left lung which was contracted to about half its normal size. The right pleural cavity was filled with air, the lung collapsed. There were no adhesions and no fluid. A pinhole perforation with slight hæmorrhage was found in the lower lobe. A few small tubercles and extensive emphysema were noted. The writer ascribes the pneumothorax to perforation of an emphysematous vesicle. Biggs' second case was a traumatic pleurisy with effusion of the right side. The needle obtained serum from the right pleural

cavity and nothing from the left. Four hours later there were severe dyspnœa and cyanosis and the left chest was tympanitic with bulging intercostal spaces. Death occurred in half an hour. Biggs' third case is quoted from Thacher. Both chests of a child were punctured to differentiate between bronchopneumonia and pleurisy. In two or three hours there was intense dyspnœa and death soon occurred. Both lungs were found collapsed and showed punctures where the needle was said to have been introduced. There was slight bronchopneumonia.

Biggs believes that pneumothorax is most likely to result from exploratory puncture when the pleura is normal and the lung diseased, especially when there is softening in the lung near the pleural surface but not involving it. Goodhart and Still (7), on the contrary, say that in cases of this accident pleural adhesions have been found postmortem, or consolidation of the lung which prevented closure of the puncture made by the needle. E. L. Hergert (9) warns against moving the needle laterally; but it is to be remembered that for the causation of this accident an actual laceration is not essential. In one of Biggs' cases the fatal perforation was of pinhole size.

The importance of pneumothorax after exploratory puncture depends upon several factors: the condition of the patient at the time of its occurrence, and the physical state of the perforated lung, which may permit contraction of the puncture or may favor extreme and progressive pneumothorax. In this connection the apparently favorable production of subcutaneous emphysema, already mentioned, should be recalled. Huber and Hirsch (10) refer to the much greater rapidity of absorption of air from the subcutaneous tissue than from the pleural cavity.

5. Infection of the pleura. Infection of a previously sterile pleura or the production of mixed infection by exploratory puncture is the bête noire of nearly every writer. Asepsis is, in fact, the chief or only precaution recognized by the majority of authors as necessary. Osler (11), for example, says: "With careful preliminary disinfection the instrument can be used with impunity." His only warning is: "Pneumothorax is an occasional sequence." R. C. Cabot (12), in speaking of Rosenbach's "palpatory puncture," says: "The amount of mobility of the point after the chest wall has been pierced tells us whether the needle is free in a cavity, entangled in a nest of adhesions, or fixed in a solid 'carnified' lung. There is no danger if the needle is sterile." Koplik (13) writes of pleural puncture: "The author has never had an accident in many such operations, and it requires but ordinary cleanliness and care." Samuel Gee (14) states that "to pierce the lung with a clean, fine needle is harmless." Similar statements might be quoted from innumerable writers, among whom may be mentioned E. Feer (15), Fiessinger (16), V. Liebermeister (17), A. Baginsky (18), B. Bendix (19), N. Oppenheim (20), A. Monti (21), O. Rosenbach (22), A. J. McCosh (23), H. B. Donkin (24), Carmichael (25), d'Espine and Picot (26), J. Comby (27), and Netter (28).

Biggs (2), speaking of infections of normal or diseased tissues or fluids by a septic needle says: "There are but few clinicians of considerable experience who have not had the misfortune to see one or more cases of simple pleurisy changing into suppurative pleurisy after puncturing with a hypodermic needle."

There are three possible sources of such an infection: (1) the needle, either not sterilized or subsequently infected by the hands of the operator; (2) the skin of the patient; (3) foci of disease in some of the deeper tissues pierced by the needle. The first of these sources may be eliminated by aseptic technique. The danger from the second source may be minimized by preliminary application to the site of the puncture of 95 per cent phenol followed by 95 per cent alcohol, or of tincture of iodine. The third source of infection, foci of disease in the lung, liver, etc., can never be absolutely excluded if the needle enters these organs.

Leaving this subject temporarily, let us consider some of the factors which may lead to erroneous imputation of guilt to exploratory puncture. In connection with Biggs' reference to cases of simple pleurisy changing into suppurative pleurisy, two facts must be recognized: (1) in cases of sacculated empye-

ma, sterile serous effusion may occur beyond the limiting adhesions, analogous to the edema which is found in the neighborhood of foci of infection elsewhere [H. Königer, (29)]. If the needle is introduced into the zone of serous exudate the inference is drawn that pus is absent. A subsequent puncture in an adjacent space may enter the chief focus, and the presence of pus suggest infection of the previously sterile exudate. (2) Of greater importance is the fact that during development of an empyema the first puncture may yield fluid which is only slightly turbid and a subsequent puncture show distinctly purulent fluid. Microscopical and bacteriological examination of the fluid first withdrawn may, however, reveal the presence of bacteria and a preponderance of polymorphonuclear leucocytes, showing that the infection was present at the time of the first puncture though the gross appearance of the fluid was misleading. Unless the second examination showed a mixed infection one would not be justified in such a case in attributing the empyema to introduction of infection from without.

The third source of possible infection of the pleura mentioned above, puncture of a focus of infection within the body cavity, has been noted by various writers, though regarded as negligible by others. Cellulitis of the chest wall may follow puncture of an intrathoracic focus of infection. A question which immediately suggests itself is whether puncture of the lung in lobar pneumonia tends to the production of pneumococcus empyema. In considering the clinical evidence bearing upon this subject, it must be acknowledged that statistics are too uncertain to be of value. Failure to secure fluid by puncture does not necessarily prove its absence, as is shown by successful attempts made immediately afterward in other portions of the chest. This would seem to render valueless any deductions drawn from subsequent punctures as to the effect of puncture upon the pleura.

W. J. S. Bythell (30) found in all post-pneumonic autopsies abundant pneumococci in the lymph spaces in every layer of the subserous and serous portions of the pleura as well as through the lung. In these peripneumonic cases, bacteria probably reach the pleura directly from the consolidated lung through the lymphatics. Klein and others have shown that there is normally a current from the pleural cavity through the serous layer of the pleura to the subserous layer; a current in the reverse direction has not been proven, but conditions under which living organisms extend through living tissues do not quite correspond to the mechanical movement of carbon pigment, etc. There is good reason to believe (Thu) that these organisms can pass directly from the lung to the pleural cavity through the pleura.

In spite of the lack of available clinical or experimental proof, it seems not unlikely that laceration of the visceral pleura would facilitate this passage of pneumococci through the visceral pleura, either mechanically or by producing a *locus minoris resistantiæ*, and so increase the tendency to empyema.

Puncture of a purulent focus in the lung may cause alarming symptoms as in case 4. Case 9, reported later, may have been an instance of puncture of a purulent collection, but apparently a bronchopleural fistula already existed.

Case 4. Cirrhosis of the liver; pulmonary tuberculosis; abscess of the lung, puncture of which was followed by symptoms of sepsis and probable rupture into a bronchus. No. 16604, an Irish laborer, 62 years of age, was transferred to the medical ward on March 6, 1908, after an exploratory laparotomy, with the diagnosis of cirrhosis of the liver, perihepatitis, and pleurisy with effusion. There were symptoms and signs of dry pleurisy from the angle of the left scapula to the base. On March 7th, the leukocytes were 14,850 with 72 per cent of polymorphonuclears; on March 19th, they numbered 15,950, and the polymorphonuclears had risen to 86 per cent. On March 24th a needle in the right chest obtained no fluid. On March 26th, there were only 12,100 leukocytes, with 76 per cent of polymorphonuclears. On April 4th, signs of slight consolidation were noted at the right apex posteriorly, but tubercle bacilli were not found until nine and ten days later. On April 10th, the sputum had increased, and had a very foul odor. The left chest showed dulness from the angle of the scapula to the base, most marked at the angle. Just below the angle the breathing and voice were bronchial, but diminished at the base. The temperature ran between 99° in the morning and 102° in the afternoon. A needle in the posterior axillary line just below the angle of the scapula obtained thick, foul-smelling pus, cultures of which contained slender Gram-negative bacilli and streptococci. This was followed by a chill last-

ing one and a half hours; before the chill, temperature was 100.2°, respiration, 40, pulse, 124; after the chill, temperature was 105.4°, respiration, 60, pulse, 160. At 8 P. M., eight hours later, the temperature was 98°, respiration, 24, pulse, 108. There was profuse perspiration during the night. The next day the leukocyte count was 12,500 with 88 per cent of polymorphonuclears, and the highest temperature was 101.8°, respiration, 60, pulse, 108. At 3 and 7.30 A. M. on the second day after the puncture the patient vomited a quantity of foul-smelling material. At 8 A. M. the temperature was 102°, respiration, 36, pulse, 102. The only pulmonary signs then were those of a thick pleura from midway between the spine and angle of the left scapula to the base. During the next four days the temperature gradually fell, the highest afternoon temperature being 100.4°. Transferred to Bellevue Hospital on April 18th.

6. Puncture of a hydatid cyst of the lung is a rare accident. Givy (31) describes such a case occurring in a child twelve years of age who was supposed to be suffering from an extensive pleural effusion of the right chest. A needle was introduced in the seventh space a little outside of the angle of the scapula, and 10 cc. of clear fluid withdrawn for diagnosis. Thirty seconds later there were sudden cough, serous sputum, later blood-tinged, marked dyspnœa, and cyanosis. Two sputum-cupfuls of blood-tinged serous fluid were expectorated, in which hooklets were found later, and a profuse urticarial eruption appeared on the trunk and abdomen. Under caffeine and morphine the child became quiet in one and a half hours, coughing less and with no sputum. At midnight, coma supervened, with increasing cyanosis, cold extremities, and slow and difficult respiration, with coarse râles. Death occurred at 2 A. M. Partial autopsy showed a large hydatid cyst adherent to the thoracic wall and diaphragm, and an atelectatic lung. The cause of death was supposed to be either an acute intoxication, as suggested by the eruption, or asphyxia due to rupture of the cyst into a bronchus. Apparently even a small amount of fluid withdrawn by puncture may have altered the tension enough to cause rupture of the cyst.

Mackenzie (32) records a death from rupture of a hydatid cyst of the lung; but in this case enough of its contents had been evacuated to account for the rupture. P. Brouardel (33) also reports a case of this accident.

7. Puncture of the diaphragm. No known instances of this accident are found in the series here reported, but several writers, including Abt (34), record cases of peritonitis from exploratory puncture, the infectious agent being carried from the pleural cavity by the needle. F. T. Lord (35) advises the use of the X-rays in order to determine the position of the diaphragm, because perforation of the elevated diaphragm has resulted in fatal peritonitis. This precaution is advisable in cases of long standing, with contraction of the thorax and secondary suppurative lesions in the lung.

8. Perforation of thoracic and abdominal viscera. Stengel (36) has seen death from perforation of the stomach and liver in exploratory puncture. It is easily conceivable that the pericardium may be infected during exploratory puncture of a sacculated empyema near its border. Goodhart and Still (7) refer to an instance of accidental wounding of the heart which caused slight hæmorrhage into the pericardium, the heart being displaced by collapse of the left lung. Puncture of an enlarged spleen might occur during exploration of the pleura. I can report no case of such an accident, but that it might easily prove fatal is shown by the result of an exploratory puncture, with a fine needle, of a much enlarged, firm spleen in an emaciated anæmic child, which I recall. Death with symptoms and physical signs of internal hæmorrhage occurred within one and a half hours, the spleen then being no longer palpable.

9. Puncture of aneurism of the aorta. R. C. Cabot (37) pronounces exploratory puncture of an aneurism with a fine needle, in doubtful cases, perfectly safe. H. M. Biggs (1), on the other hand, quotes F. S. Dennis as referring to a case of continued oozing from an aneurism after puncture with a hypodermic needle. Obviously, the condition of the aneurismal wall at the time of puncture, its thickness and elasticity, are factors bearing upon the danger of puncture. When the wall is so thin that rupture is imminent, a slight trauma may precipitate this fatal accident or cause such a leakage as Dennis reports. Case 5 is the record of an accidental

puncture with no sequelæ, of an aneurism of the descending portion of the thoracic aorta in a patient with signs of aortic and mitral regurgitation and with a serous effusion in the pleural cavities submerging the aneurism.

CASE 5. Aneurism of the aorta; hydrothorax; accidental puncture of aneurism without sequelæ; death. No. 3449, a man of 62 years, a painter, native of the United States, was admitted January 11, 1900. He gave no rheumatic or specific history and was not alcoholic. He had been treated for "chronic endocarditis" in 1895, and at that time had dullness over the manubrium with a to-and-fro murmur. For three months he had had dyspnœa, weakness, pain in the cardiac region, palpitation, cough with mucopurulent sputum, at times blood-tinged, and for two weeks gastric distress, with vomiting on the day of admission. For three days he had had swelling of the feet. The apex beat was in the seventh space, 16.5 cm. from the median line, diffuse, heaving. Cardiac dullness extended to the left border of the sternum; above to the third space. The heart action was forcible but irregular in frequency. A musical systolic murmur at the apex transmitted into the axilla was also heard over the back of the chest. There was also a systolic murmur along the right border of the sternum and over the vessels of the neck. A diastolic murmur at the second right space transmitted downward along the sternum was heard over the greater part of the precordia. The pulse was irregular in frequency and force, of Corrigan type. A capillary pulse was present. The left chest from the ninth space to the base showed flatness, nearly absent fremitus, breathing and voice, no râles; at the ninth space, egophony. The right chest was dull from the eighth space down; from the ninth to the base were slightly diminished breathing and voice and many subcrepitant râles. On January 18th, signs of pleural effusion having increased, the left chest was aspirated and eighteen ounces of clear serum obtained. Five days later there were signs of fluid in the left chest from the angle of the scapula down, and aspiration yielded twenty-seven ounces of clear serum. On January 26th, similar signs were noted in the ninth space. An exploratory puncture was made about in the line of the angle of the scapula and below the supposed level of the fluid. The syringe filled instantly with blood. It was withdrawn rapidly and no unfavorable symptoms, subjective or objective, were noted. On January 27th signs of fluid in the left chest had risen to the angle of the scapula, and aspiration yielded twenty-eight ounces of clear serum, not at all blood-tinged. Breath and voice sounds were then found to be inaudible over an area extending about 7.5 cm. from the median line, and a very loud systolic murmur was heard over this area. The patient, who had become progressively worse for the past week, died at 2 P. M. on January 28th. The autopsy, by Dr. G. P. Biggs, showed aortic aneurism, cardiac hypertrophy and dilatation, relative insufficiency of the aortic and mitral valves, and cirrhosis of the liver. The entire thoracic aorta was quite uniformly enlarged to a diameter of 6 cm., the distended vessel projecting into the left thoracic cavity and touching the ribs in some points in the region of the posterior axillary line. There were two slight areas of additional fusiform dilatation in which mixed parietal thrombi were found. Each pleural cavity contained 1,000 cc. of serous fluid. There was a similar slight pericardial effusion. The left lung was much compressed and very poorly aerated except the anterior portion which was emphysematous.

10. Hæmorrhage due to exploratory puncture may result from injury of an intercostal artery or of the lung. Accidents of the former type are not common, as the close relation of the artery to the rib usually protects it. W. G. Smith (38) quotes Naunyn as having in one case wounded an unusually large atheromatous intercostal artery. A huge hæmothorax resulted and death occurred within a few minutes. Waldvogel (39) records a fatal hæmorrhage in a child of three years from an abnormally situated but otherwise normal intercostal artery punctured with a trocar. Norman Moore (40) mentions a case of pleural effusion in a man of 59 years, in which death resulted from hæmorrhage from an intercostal artery wounded with a trocar. The pleural cavity contained twenty ounces of blood clot, and thirty-six ounces of blood-stained fluid and fluid blood. A. R. Edwards (41) once saw extensive hæmothorax and subcutaneous hæmatoma after a pleural puncture in which the trocar was impatiently thrust in and out during an unsuccessful thoracentesis. The absence of recorded hæmoptysis suggests that the injury was not pulmonary, and so not improbably involved an intercostal artery.

Much more common are injuries of a congested lung or of one of its blood-vessels. In these cases hæmoptysis may be the only unfavorable symptom and be of no significance other than as proof that the lung has been punctured, the hæmorrhage subsiding immediately. Such an occurrence is represented by

CASE 6. Hæmoptysis during exploratory puncture. A woman in Ward L, in 1901, showed signs at the base of one lung which suggested a pleural effusion. On exploratory puncture no fluid was obtained, but abnormal resistance like that of thick

pleura or consolidated lung was encountered. Immediately the patient raised three or four mouthfuls of bright red fluid blood, but showed no other symptoms. The needle was withdrawn at once and morphine administered hypodermically. No further hæmoptysis occurred and there were no sequelæ.

Goodhart and Still (7) record a similar accident, a case of chronic consolidation of the base from pneumonia and collapse of the lung in a child who coughed up about two drams of bright red blood immediately after exploratory puncture, but none subsequently, and who had no other symptoms. According to Sokolowski (42) and Stintzing (43) puncture of the lung causes only spitting of blood a few times. George Carpenter (44) on one or two occasions saw small amounts of frothy blood in the mouths of children and pallor after exploration. A. A. Smith, quoted by Biggs (1), has called attention to cough with bloody sputum for several days after exploratory puncture of the lung.

In case 7 the hæmoptysis was alarming, but seemed to have no effect on the course of a fatal pneumonia.

CASE 7. Acute lobar pneumonia; hæmoptysis after puncture; pulmonary edema; death. No. 17795, a Russian housewife, 38 years of age, with no occupation, was admitted December 28, 1908. One year before, she had been confined to bed for two weeks with severe bronchitis. On December 25th, she had a chill, fever, pain in the right chest increased by coughing, cough with thick yellow sputum which became tenacious and blood-tinged. On admission the temperature was 104.4°, respiration, 28, pulse, 124. Examination showed restricted expansion of the right chest with dullness anteriorly from the second rib to the base. The right axilla showed dullness, diminished breathing and voice, and below the fourth rib absence of fremitus. Posteriorly there was dullness from the angle of the right scapula to the base, with diminished fremitus; bronchial voice and breathing were present from one inch above the angle of the scapula to the base, near which they were somewhat distant. There were a few crepitant and subcrepitant râles over the right chest posteriorly. There were no sclerosis of the radial arteries and no signs of cardiac lesion. Leucocytes numbered 18,200, and polymorphonuclears 93 per cent On December 29th, at 3 A. M., pulmonary edema was partly relieved by cupping. At 3 P. M. a needle was inserted in the right chest and no fluid obtained; about two drams of fine blood filled the syringe. Almost immediately the patient began to spit up blood, about four ounces in all. She was given Magendie's solution and became quiet. There was no return of hæmoptysis. On December 30th, the fifth day of the illness, the rectal temperature fell to 99.4°, rising to 101.4° the next day, but the pulse and respiration remained frequent; the patient was restless and coughing. Pulmonary edema developed and death occurred on January 1st at 12.30 A. M. No autopsy was obtained.

Case 8 is an example of still more alarming symptoms from puncture of a consolidated lung, the cyanosis and rapid respiration apparently being due to the presence of blood and pus in the bronchi. There were no evidences of cardiac or respiratory inhibition. The fatal termination of the case was apparently quite independent of this accident.

CASE 8. Abscess of the lung or empyema, with broncho-pleural fistula; hæmoptysis; pain, cyanosis, and dyspnœa after puncture; death. No. 16301, a Russian, driver, 30 years of age, admitted December 13, 1907, had had, ten months before, an operation for non-tuberculous osteomyelitis of the lower jaw. Considerable discharge lasted until another treatment six weeks before admission. There were no previous cardiac or renal symptoms and no pulmonary, until seven months before admission. During this time there had been cough, profuse greenish yellow sputum with a bad odor, and pain in the right chest aggravated by coughing. For one month there had been chilly sensations, fever, night sweats, poor appetite, nausea, and inconstant epigastric pain not affected by eating or motion, radiating upward. The patient had lost about twenty pounds in four weeks. The right chest showed dullness from just below the spine of the scapula to the base, becoming very marked at the angle of the scapula, diminished fremitus, and bronchial breathing most marked at the angle of the scapula. From the spine to the angle were many subcrepitant râles and a few below the angle after coughing. The voice was very nasal at the angle of the scapula. In the left interscapular region were dullness, bronchial breathing and crepitant râles. The temperature was 102°, respiration, 36, pulse, 120. The leucocytes numbered 30,200, of which 81 per cent were polymorphonuclears. The next day a needle was inserted in the eighth right space internal to and below the angle of the scapula. Nothing was obtained. The patient complained of great pain over the precordia, became cyanotic with rapid respiration, and spat up a few ounces of bright red blood and pus which had a foul odor. The pulse remained regular, of good size and force. The patient felt more comfortable about one hour later. Four subsequent punctures of the right chest posteriorly yielded no fluid, but caused no unfavorable symptoms. The X-rays showed consolidation, the physical signs of which persisted, with a septic temperature and purulent sputum. On January 6th, signs of a cavity had developed near the right apex. Eleven sputum examinations for tubercle bacilli were negative. Death occurred on January 12th.

George Carpenter (45) reports the case of a girl, five years of age, with cough, blood-streaked yellow sputum, and night sweats. The physical signs were apparently those of empyema of the left chest. Exploratory puncture was performed in the eighth left space in the posterior axillary line, and ten

minims of pus mixed with air obtained. Coughing occurred after insertion of the needle; blood poured from the mouth and nostrils; and the child died asphyxiated. Autopsy showed the left lung cirrhotic and consolidated, the new fibroid tissue very vascular; bronchial walls thickened and irregular; bronchi and larynx full of blood-stained mucus extending on the right side into the medium sized bronchi, on the left into the smallest. The stomach was full of blood, with little in the duodenum. There were no signs of tuberculosis.

Other cases of fatal asphyxia from pulmonary hæmorrhage are recorded by Metzlar and Bönniger. C. Metzlar (46) reports a case of fatal hæmorrhage during exploratory puncture which perforated the lung of a woman of 63 years. The blood collected during life and from the bronchi at autopsy was not more than 75 cc. He refers to the woman's age and lowered resistance due to pneumonia as possibly explaining death after so slight a loss of blood, and to the possibility that restriction of respiration by lying on the healthy side contributed to the result. There were no suggestions of a pleural reflex. Pneumonia was followed by right-sided empyema, for which thoracotomy was performed. On the fourteenth day there were pain in the chest and a rise in temperature. Five negative punctures were made and a few drops of pus were obtained by a sixth. The needle was left in the chest as a guide. After three more negative punctures there were hæmoptysis, symptoms of asphyxia, and death. At autopsy the left main bronchus was found filled with blood clots, and the right main bronchus almost filled with blood and mucus. At the site of puncture the lung was deeper red than elsewhere.

Bönniger's (47) patient was a woman of 78, admitted as a case of pulmonary tuberculosis and general bronchitis, with dullness, diminished fremitus and breathing, and râles at the left base. To exclude the presence of fluid, an ordinary exploring needle was introduced in the seventh space 8 cm. from the spinal column. No fluid was obtained. The patient immediately coughed up bright blood, became markedly cyanotic with dyspnœa and syncope, and died within a few minutes. The autopsy showed no blood in the left pleural cavity, a small puncture in the visceral pleura, old tuberculosis at the apex, and considerable blood in the left bronchi, little in the right. The base of the left lung was filled with blood, but no large vessel showed injury. The writer attributes his accident to puncture of both a bronchus and a blood-vessel in a hypostatically congested lung, the patient being too feeble to cough up the blood and avoid asphyxia. He cautions against exploratory puncture in feeble subjects with hypostasis.

S. Laache (48) reports a case of double postpneumonic empyema in a man of 21, with pseudocrisis on the sixth day. Operation for empyema of the right chest was performed on the twentieth day. On the twenty-third, pus was obtained by exploratory puncture in the eighth left space posteriorly. Immediately the patient expectorated 30 grams of fresh blood. At the site of puncture a hæmatoma nearly as large as a child's head formed. Repeated hæmoptysis occurred, about 500 grams by the next morning, but the general condition remained good. Hæmorrhage stopped the following day, but the sputum remained blood-tinged for a long time.

A. Jacobi (49) describes a case in which, at operation, the lung was found bleeding as the result of exploratory puncture for empyema. The needle had reached the pus through adherent twisted lung.

Among the cases recorded under the next heading, pleural reflex, are nine in which hæmoptysis occurred. In three of these (Wilks, Hamilton's 1st, Dayton's case 9) it was so profuse as to be alarming; in the other six (Russell's 1st, Fortescue-Brickdale, Parkinson, Armstrong, Hamilton's 2d, Miller) it merely indicated puncture of the lung and was subordinate to symptoms of syncope.

Of the twenty-one cited cases of hæmorrhage from the lung resulting from exploratory puncture, sixteen were definitely cases with consolidation of the lung, one with hypostatic congestion, two of postpneumonic empyema, and one of adherent and twisted lung. The relative danger of puncturing consolidated lung, as regards the production of hæmorrhage, is obvious. Only seven of the twenty-one cases with hæmorrhage from the lung died, and in only two of these [Carpenter (45), Bönniger (47)] was death ascribed to asphyxia, and in one [Metzlar (46)] to hæmorrhage in an aged woman with lowered resistance due to pneumonia. Bönniger's case, marked by syncope, hæmoptysis, dyspnœa, and cyanosis, might perhaps be more correctly considered under the heading of death due to pleural reflex. Wilks' (50) case, classed under the latter heading, showed hæmorrhage of about six ounces in a child of three years, and strongly resembles the death which Carpenter attributes to asphyxia; but the sudden respiratory failure points to reflex inhibition or vasomotor paralysis.

11. Albuminous expectoration. This phenomenon has been frequently recorded as a sequel to aspiration of pleural exudate; but Oliver (51) records one case (third case) in which it occurred after only a small syringeful of serum had been withdrawn. This he (52) cites as showing that this accident is not al-

together due to sudden alteration of pressure by removal of fluid from the pleural cavity.

12. Pleural reflexes: cardiac or respiratory failure, convulsions, coma, paralyses, etc. Of all the accidents attributed to exploratory puncture of the pleura or lung, those of this group, usually characterized by syncope or sudden death, are the most striking and important. Though syncope may result from simple emotion, as is seen even in patients whose fingers have been pricked to obtain blood, and though some of these accidents are attributed to organic cerebral lesions, the majority appear to depend upon a pleural reflex. These causes will be considered after a brief report of the available recorded cases, two of which, of distinctly different types, occur in the present series. Case 9, though complicated by hæmoptysis, apparently belongs in the class of pleural reflex cases on account of the predominant symptoms of cardio-respiratory weakness.

CASE 9. Acute lobar pneumonia, delayed resolution; hæmoptysis and respiratory and cardiac inhibition after exploratory puncture; recovery. No. 15852, a glass cutter, 18 years of age, born in Poland, was admitted to New York Hospital August 31, 1907. His family history was negative. He had had no previous illnesses, no pulmonary, renal, or cardiac symptoms. Thirty-six hours before admission he developed typical symptoms, sputum, and physical signs of pneumonia of the left lower lobe with temperature 104°, respiration, 40, pulse, 136, and on September 9th the same signs in the right lower lobe. On September 1st the leucocytes were 16,200 with 94 per cent of polymorphonuclears, and on September 5th there were 32,000 and 95 per cent. The temperature ran between 103° and 104° until the ninth day, then 102° to 103°. On September 10th, the twelfth day, the leucocytes numbered 43,000 and polymorphonuclears 96 per cent and the notes state: "Right lower lobe, dullness, soft bronchial breathing, and many crepitant râles; fremitus comes through. Left lower lobe, dullness, harsh bronchial breathing and fewer râles; voice slightly nasal; fremitus comes through." A needle was inserted in the right chest and a syringeful of blood obtained. Immediately after this the patient spat up several ounces of blood, became very cyanotic, and stopped breathing, and his pulse became imperceptible. After stimulation, artificial respiration, and turning him on his face, he revived considerably and pulse and color became much better. Defervescence occurred on September 11th. Ten days later the temperature had become normal and only a few moist râles were heard at the right base, but signs of consolidation did not disappear from the left base until thirty-two days after the crisis.

In case 10 the fatal issue was attributed to cerebral hæmorrhage or embolism, without postmortem proof; but similar symptoms have been recorded in cases in which at autopsy no cerebral lesions were found (Russell's 3d, and case of Mollard, Favre, and Cordier).

CASE 10. Lobar pneumonia; septic arthritis; cerebral hæmorrhage (?) with left hemiplegia after exploratory puncture; death. No. 13625, a man 50 years of age, single, janitor, native of the United States, was admitted March 6, 1906. Family history negative. He had had scarlatina and mumps and had been operated upon for cervical lymphadenitis in childhood. He had had malaria about twenty-five, and erysipelas two years before admission, and gonorrhœa several times. He gave no syphilitic history excepting a suggestive iritis, and had had no pulmonary, cardiac, renal, or vascular symptoms. He had had stomach trouble for years, attributed to loss of teeth. He habitually drank four or five beers daily and much ale. Seven days before admission he had a chill, sharp pain in the right chest, severe cough, sputum which soon became rusty, fever, and prostration. Four days before admission the dorsum of the right foot became swollen, red, and hot. The pupils were equal and reacted sluggishly. The apex beat was in the fifth space, 10 cm. from the median line. The right border of cardiac dullness was normal. Heart action was forcible, sounds were clear with no accentuations. The pulse was full, bounding, with no increase of tension; the arteries were moderately thickened. The chest was barrel-shaped. Over the sternal half of the right upper and middle lobes were a few sibilant and moist râles; over the outer half, marked dullness, diminished breathing, and a few crepitant râles; just above and to the outer side of the right nipple were marked bronchial breathing and voice over an area the size of the palm of the hand. Posteriorly there was marked dullness above the level of the ninth right rib; over the upper and lower lobes breathing and voice were of nasal quality. There were many moist râles at the base of the right axilla. The liver dullness extended about 7 cm. below the costal margin in the parasternal line. On the dorsal surface of the right foot was an area 7.5 cm. in diameter, red, hot, swollen, and tender, and a similar area 4 cm. in diameter below the internal malleolus. Old varicose veins were present on the left shin. The leucocyte count was 20,600 with 95.5 per cent of polymorphonuclears; on March 16th it had risen to 46,500. On March 17th the right chest showed marked dullness down to the angle of the scapula and thence along the vertebral column to the base over a space 8 cm. wide, where breathing was diminished and had a slightly nasal quality and vocal fremitus was increased. On March 19th the nasal breathing had disappeared; râles were fewer; fremitus and voice were normal. There was almost complete absence of breath

sounds over the right lung. The leucocytes numbered 16,800, polymorphonuclears 89 per cent. The temperature had shown gradual lysis with an excursion of about 2° each day, and was then 99.4° to 101°. On March 20th a needle was inserted in the right chest posteriorly, which was followed immediately by unconsciousness, with the eyes turned to the left, fixed and staring. There was apparently complete left hemiplegia with exaggeration of the reflexes of the left side. The systolic blood pressure was 138 mm. At 12 M. respirations, previously 22 to 28, were 40, and pulse, previously 104 to 112, was 120. Death occurred at 4.45 A. M. on March 21st. No autopsy was allowed.

I have collected records of the following twenty-one cases allied to those just described.

H. B. Whitney (53), speaking of sudden death resulting from aspiration of pleuritic effusion, says: "In some of these instances the shock of puncture alone has undoubtedly been sufficient to cause a fatal syncope in an already damaged heart. I know personally of such a case in which death followed a simple exploratory puncture."

In 1898, A. E. Russell (54) recorded three cases. Case 1, a girl aged eight years, had had "inflammation of the lungs" two years before. On admission there were some dyspnœa, cough, vomiting, and headache. Over the right upper lobe anteriorly, and posteriorly down to the angle of the scapula, were dullness, tubular breathing, and a few crepitations, with a friction rub at the base. Two days later these had disappeared, and at the left base were similar signs. Defervescence by crisis occurred two days later. Next day there was otorrhea with pneumococci in the discharge and a return of fever. Five days later a needle was introduced in the ninth left space, one and a half inches from the spine; only one or two drops of blood were obtained. A small amount of frothy mucus appeared at the nose and mouth; the face became livid; there were convergent squint, and cardiac and respiratory failure. Autopsy showed the left pleural cavity obliterated by old adhesions. The left lung was small and heavy, its bronchi full of thick pus; the smaller bronchi were dilated and their walls thickened, those at the base entering small cavities filled with pus. There were no signs of tuberculosis except one small caseous node. The bronchial lymph nodes "were enlarged and succulent." The remaining viscera showed no signs of disease.

Case 2 was a girl of seven years. Signs at the right base suggested pus. A needle was inserted there and very little fluid and blood obtained. Loss of consciousness occurred during the puncture, with cyanosis and pallor of the right half of the face. Convulsions began two hours later. Next day the child was still practically comatose and the head remained retracted for two days. Two days later she was irritable and had incontinence of feces. The next day unconsciousness supervened, and death occurred one day later. Autopsy showed the base of the right lower lobe collapsed; bronchopneumonia in the upper part of the same lobe and in other parts of the lungs; much pus in the bronchi. The brain was vascular with a few superficial hæmorrhages in the pia. The bronchial glands were swollen but not tuberculous.

Case 3, a man of fifty-two years, who had had a pulmonary hæmorrhage thirteen years previously, gave a history of cough for three weeks. At the left base, up to the seventh space, were dullness, amphoric breathing, whispered pectoriloquy, and egophony. A needle in the eighth left space below the angle of the scapula encountered solid tissue but no fluid at a depth of one and a half inches. In the ninth space it yielded one dram of blood with light streaks. The patient said he hardly felt the needle, passed a large quantity of urine, turned pale, and fell back with sudden failure of respiration and feeble and irregular heart action. A convulsion occurred, involving the left arm; the left leg became rigid. Then coughing began. The patient was unable to answer questions; left hemiplegia was noted and rigidity of the right arm. Severe convulsions followed. Death occurred three days after the puncture. Autopsy showed local adhesions over the left lower lobe corresponding with the three lower spaces; the lower lobe moderately contracted and solidified, especially at the base; a calcareous mass at the right apex; a few fibrous nodules elsewhere. The aortic, mitral, and pulmonary valves were slightly thickened. The right ventricular wall contained areas of fatty degeneration; the left was somewhat pale. The pia was rather opaque, the dura a little thickened; there was no cerebral embolism or softening.

Sir Thomas Oliver (51) in 1904 recorded three cases with scanty details. Case 1, a man of sixty-two, was thought to be an unresolved pneumonia possibly with fluid in the pleural cavity. The slightly fetid, blood-tinged mucopurulent sputum contained no tubercle bacilli. The temperature was not high. A needle was inserted in the right chest while the patient was sitting in bed; no fluid was obtained. It was inserted again in another place, and the patient almost immediately fell back, dead. Autopsy showed some emphysema of the left lung; several ounces of pus in the right pleural cavity; the right lung consolidated at the base and containing two small abscesses. Case 2 was a man of thirty-six. At the time of exploratory puncture of the pleura there was only slightly increased frequency of respiration, but in a few hours delirium. Death occurred on the following day, "being undoubtedly an indirect result of the puncture." In case 3, a man with physical signs of fluid in the chest, exploratory puncture was attended by very marked cyanosis and by expectoration of large quantities of thin foamy mucus, with persistent lividity and collapse lasting several hours. The patient rallied in two days.

In 1905 three observers reported isolated cases before the British Society for the Study of Disease in Children, and in editorials (55) the accidents of exploratory puncture were given their first prominent recognition.

J. M. Fortescue-Brickdale's (56) patient, a boy two years old with marked signs of rickets, was admitted with pneumonia. He improved temporarily, but empyema was subsequently suspected. With the child sitting up, supported, a needle was introduced in the seventh space just outside of the scapula, and only a little blood was obtained. The child became very restless, coughed up a little frothy blood, and became cyanotic with imperceptible respiration. Artificial respiration induced only a few irregular gasps in about ten minutes. These became weaker and fewer, and death occurred in spite of stimulation. No autopsy.

The case of J. Porter Parkinson (5) was also that of a child four years of age, whose history was that of a chronic illness for at least two months. It was thin and cachectic. There was extreme dullness with harsh but faint breathing over the left axillary and subscapular regions. The heart was apparently not displaced and there were no signs of disease in other organs save slight bowel irregularity. The temperature varied from normal to 102°. The diagnosis of chronic interstitial pneumonia following unresolved pneumonia was made; but in order to exclude the presence of fluid an exploring needle was inserted in the eighth space in the posterior axillary line to a depth of between 1 and 1.5 inches. No fluid was obtained, but bleeding followed. The child at once turned pale; the pulse began to become small, and frequently about a teaspoonful of blood escaped from the mouth. Death took place within two minutes. Autopsy revealed a cirrhotic lung, one or two of whose bronchi in the lower lobe were filled with blood. The stomach was distended with swallowed blood.

The child seen by J. H. Wilks (50), a girl of three years, had not been well since an attack of measles six months before. She had a brassy cough and a temperature of 101°. There were diminished respiratory movement of the left chest with general dullness, especially in the suprascapular region, and diminished breath sounds with prolonged expiration; posteriorly these were tubular. A needle was introduced in the eighth left space just below the angle of the scapula, with the child recumbent. A few small flakes of curdy pus were withdrawn, with some blood. Immediately afterwards bleeding occurred through the needle, and blood was coughed up. The pupils dilated, the sphincter ani relaxed, and no respiratory efforts were made. The child appeared to be moribund at once. Artificial respiration elicited merely a few gasps and stimulation was ineffective, blood pouring from the mouth and nostrils and becoming of a coffee-ground color. Autopsy showed universal adhesions of the right pleura. The site of puncture was seen about one inch from the base of the right lung, which was indurated and contained caseous tuberculous foci. The smaller bronchi contained blood clots and pus; there were peribronchial inflammation and irregular bronchopneumonia. The heart showed cloudy swelling; the right ventricle was dilated. A few tubercles were found in other organs.

An inquest upon a boy whose chest had been explored at St. Thomas' Hospital under an anæsthetic, is reported in an editorial (44). Death occurred immediately when the chest was punctured and was attributed to reflex cardiac failure. "The left lung had been rendered useless owing to disease."

J. W. Findlay (57), in 1906, cited, in a discussion, a case of pneumonia. On the ninth day he inserted a large needle, and the man had a convulsion followed by coma, and died two days later.

G. G. Sears (58) records a case in which he thought it improbable that the exploring needle could have reached the pulmonary branches of the vagus, as autopsy showed considerable fluid between the layers of the pleura. The patient, a man aged forty years, entered the hospital with an effusion filling the left chest to the third rib. On the next day sixty-four ounces of bloody fluid were removed by aspiration. The temperature remained elevated and the fluid reaccumulated, so that a second attempt at aspiration was made three weeks later. The prospect of operation apparently produced no mental perturbation and he did not wince when the needle was introduced, but almost immediately collapsed and became cyanotic and almost pulseless. The needle was at once withdrawn. Efforts at stimulation failed, and he became unconscious and died about fifteen hours later. There were no symptoms which suggested a possible cerebral lesion. The left pleural cavity contained several hundred cubic centimeters of bloody fluid, and the left lung was much compressed. The lower part of the upper lobe and the whole of the lower were covered with membrane from 1 to 2 mm. in thickness. Scattered through this fibrous covering and over the parietal pleura, which was also thickened, were numerous small gray tubercles. The lung failed to reveal any old tuberculous focus. The heart was normal. The kidneys showed acute glomerular nephritis.

Hubert Armstrong (59) observed in 1907 a child of two years and nine months with chronic interstitial pneumonia, possibly tuberculous. A needle was inserted in the right posterior axillary line just below the angle of the scapula. Only a little blood was obtained. The respiratory movement of the needle showed that it had entered the lung. The child gave a gasp and then began to cough, bringing up a quantity of frothy mucus freely stained with blood. At the same time she became pallid and broke into a profuse sweat; the pulse failed, the facial expression took that "far-away" look characteristic of impending dissolution. Under stimulation the cough soon stopped and she revived.

T. R. C. Whipham (60) puts on record the case of a child one year of age who had had measles three months before, followed by lobar pneumonia.

There was a rise of temperature after the crisis with persistence of distant bronchial breathing. A needle in the seventh left space yielded no pus. "Immediately on withdrawing the needle the child became a very bad color, assumed a position of opisthotonos, and died almost at once, artificial respiration and stimulation being of no avail." No autopsy was obtained.

W. F. Hamilton (61) reports two cases of this type. The first, a man of fifty-seven years, gave a history of fever, weakness, cough, and pain in the lower part of the left chest, of ten days' duration, and showed dullness from the third rib downward, extending into the axilla, and distant breath sounds and a few moist râles in the axilla. The sputum was blood-stained at times. Exploratory puncture in the left axilla on the next day yielded only a few drops of frothy blood-stained fluid. Three weeks later a few drams of clear fluid were obtained, and again two weeks after this. Six weeks after admission another puncture was made in the eighth left space in the posterior axillary line, the patient lying on his right side with the head somewhat elevated. "Immediately following the insertion of the needle the patient was seized with alarming dyspnœa and collapse, at the same time he spat up a considerable quantity of blood. His face became an ashen hue, the sphincter ani relaxed, and bowel contents discharged; the extremities were cold and there was involuntary urination; the pulse was very rapid (147), and weak. The right lung, hitherto quite clear was filled with moist râles, while an ominous rattle was heard in the throat and trachea. Stimulants were promptly applied and the patient gradually returned to his former condition. Within four hours the right lung was again clear." The diagnosis was made of acute lobar pneumonia, pleurisy with effusion, and chronic nephritis.

Hamilton's other case was a girl, ten and a half years of age, who had had pneumonia at the ages of six and eight years, and had not been well since a severe cold about three months before. A chill, vomiting, fever, cough, and pain in the right side, were accompanied by signs and a radiographic shadow suggesting infiltration of the lower portion of the right upper lobe and possibly the apex of the middle. The temperature did not remain down after what might have been a crisis, so exploratory puncture was done on the fourteenth day (February 23d). The first puncture with a medium sized needle was made in the fourth space in the posterior axillary line in an upward direction, with negative results. A second puncture was made in the same space in the anterior axillary line. No fluid was obtained and the needle was immediately withdrawn without moving it about. "Immediately on withdrawing the needle a peculiar respiratory sound was heard, head was suddenly drawn forcefully back, the whole body became rigid, the teeth firmly closed, the sphincters of the bladder relaxed, the face became cyanosed, and the skin over the body and extremities was marked with areas of marble whiteness and dusky redness. The pulse could not be felt — the respiration was suspended. Early in the seizure a little blood came from the nose as the head was so strongly retracted and the mouth closed. The rigidity lasted about twenty minutes and relaxations set in with some clonic spasms. The mottling of the skin gradually gave way to a uniform pallor and duskiness, and unconsciousness continued for fully one hour. The foot of the bed was elevated, artificial respiration begun, and strychnine given hypodermically." "The patient recovered consciousness, but she was excitable, restless, crying, and complaining of headache, especially after the attacks of vomiting which recurred at intervals during the first afternoon. The vomitus consisted of coffee-ground matter with traces of bright blood and milk curds. At six o'clock she complained of being totally blind; her pupils were dilated and inactive. For a time everything went on favorably, the patient passed feces and urine voluntarily during the early part of the night, and was quiet most of the time, sleeping at intervals. Shortly after midnight convulsive seizures set in and recurred until 4 A. M. They began usually in the left arm, and sometimes in the left side of the face, spread to the left leg and then became general. They usually ended as they began, but the right side of the face or the right arm was sometimes in spasm after the spasm in the muscles on the left had ceased. These seizures recurred at intervals varying from a few to twenty minutes, and their duration varied also from twenty seconds to two minutes. The time between the spasms lengthened with succeeding attacks, and after the thirtieth convulsion was over at 4 A. M. she remained very quiet and apparently comatose until 11 A. M. When she awoke about noon she was somewhat irrational, but this state gradually disappeared. There was, however, a paresis of the left arm and leg. She was very irritable and resented being disturbed. On February 25th she admitted that she saw but indistinctly. There were general signs of improvement on the 28th. She seemed again quite normal."

J. Mollard, M. Favre, and V. Cordier (62) report that a laundress, thirty-seven years of age, previously healthy, had an abortion about September 20th, followed by chills, high temperature, signs of salpingitis, pyuria, then cough with bloody sputum. An area of dullness developed and persisted, two finger breadths below the angle of the right scapula, and the X-ray showed an opacity there, while the temperature chart revealed daily oscillations of 4°. On November 2d, about four weeks after the onset of pulmonary symptoms, a needle was introduced over the suspected area; but only a few drops of blood were obtained. Immediately after its withdrawal an epileptiform convulsion occurred, involving the face and left side with exopthalmos and deviation of the eyes to the right: bilateral clonic movements for one or two minutes, a tonic phase of six or seven minutes, then a stertorous period with occasional clonic movements. Consciousness re-

turned for about two hours, and was followed by stertor and later by convulsive movements of the arms. Death occurred about fourteen hours after the puncture. Autopsy showed the right pleura universally adherent, the right upper lobe consolidated and containing an abscess cavity in its center and a smaller one at one side. The middle lobe, like the upper, showed inflammatory changes with fibrocaseous nodules. The lower lobe was slightly atelectatic but without tuberculous lesions. The left pleura had a few adhesions at the apex, with a small pleural exudate; in the left lung were a few subpleural ecchymoses, a large abscess in the upper lobe, a few calcified tubercles, and emphysema. The heart was rather soft. The aorta showed probable syphilitic lesions. There were 100 grams of serofibrinous pericardial exudate. The brain showed only very moderate subarachnoid and ventricular edema.

Leclerc is quoted by Mollard, Favre, and Cordier (62) as having reported briefly a case of epileptiform convulsions after exploratory puncture, with recovery.

Weill is quoted by the same writers (62) as having recorded a similar case in a child of eight, which had a convulsive seizure after exploratory puncture with a needle, but recovered.

D. J. M. Miller (63) recalls the case of a boy, two and a half years old, who fell into syncope and coughed up blood after exploratory puncture. He says that there was no fluid and that the lung was wounded.

Before attributing the accidents and fatalities just described to exploratory puncture it is well to remember that, as P. Brouardel (33) says, of all pulmonary affections, pleurisy causes the greatest number of sudden and unforeseen deaths. There are cases of latent pleurisy with gradual effusion in which there is only slight shortness of breath, without severe attacks of suffocation. He has seen thirty such cases at the morgue in twenty-one years. Besides these cases of pleurisy with very abundant serofibrinous effusion, there are others with less fluid, sometimes purulent, and involving the diaphragm, which cause sudden death.

In estimating the danger of exploratory puncture of the chest, one must take into account the occurrence of such cases as those to which Brouardel refers, cases in which sudden death may occur after slight exertion or even without apparent exciting cause. In one of the cases which he quotes the patient had been sent to bed in order to have paracentesis performed. He died while the physician was entering the house. Had life been prolonged until after even a fine needle had been inserted into the chest, and the sudden death then occurred, one would have been apt to consider the exploratory puncture as the exciting cause of death.

M. Roch (65) attributes fatalities during or immediately after operative intervention to diminution of the resisting power of the nervous system by fear or emotion, to change of position, and sometimes to shock from the traumatism.

Change of position, especially from recumbency to a sitting posture, has been particularly emphasized (66) as a cause of sudden death in pleurisy with effusion, probably by suddenly altering the vascular conditions within the thorax. W. C. Bosanquet (67) utters a particular warning against laying the patient on his sound side and so embarrassing respiration. He cites the case of a debilitated old woman suffering from an old empyema in whom immediate death resulted owing to the surgeon's turning her on to the sound side to explore the chest.

G. Lemoine (64) believes that sudden death during puncture of the pleura is a pure coincidence due to the coexistence of serious lesions with the effusion.

O. Leichtenstern (68) says that in cases of pleuritic effusion sudden death or severe attacks of syncope may result from embolism of the pulmonary artery, thrombosis of the right auricle and ventricle and vena cava superior, or from embolism of the cerebral arteries. Some fatal cases show a negative autopsy or such conditions as fatty degeneration of the heart, anæmia of the brain, edema of the brain or of the lungs. His paper includes thirteen cases of sudden death in pleurisy with effusion without pleural puncture.

Ed. Weill (69), who has collected twenty-seven cases of sudden death in pleurisy without intervention, says that it seems connected chiefly with thrombosis or embolism of the heart and pulmonary artery, pulmonary edema of the opposite lung, and myocardial changes. Cases attributed to simple functional disturbances like severe syncope, to mechanical troubles like deviation of the

heart, torsion of the vessels, and kinks of the ascending vena cava, and to hypothetical lesions like capillary embolism of the brain, must be accepted with reservation. Sudden death occurs in right sided pleurisies with equal or greater frequency than left sided; in acute or chronic cases; with the effusion increasing, stationary, or decreasing; and usually after some movement or effort.

Among the earlier reported cases of sudden death during or shortly after exploratory puncture, children predominated, and one might naturally have suspected the existence of status lymphaticus in these fatal cases. As far as I can discover, this view has not, however, been generally emphasized, though L. E. Holt (70) says of status lymphaticus: "It is one of the most frequent explanations of unexpected death from slight causes, such as an exploratory puncture. J. P. C. Griffiths (71) makes a similar observation. In twenty-one of the twenty-three cases which I have reported or quoted, in which the age is given, only fifty-two per cent were children. Among all the autopsied cases I find no evidence of status lymphaticus.

Excluding the cases in which some such organic lesion as embolism can be found to account for sudden death, syncope, etc., there remain certain cases not explained by post-mortem findings, those which are attributed to the so-called pleural reflexes, of which the twenty-three cases just described appear to be examples.

It is of interest to note that Lendet (72) as early as 1876 reported a case which had been operated upon for empyema, in which introduction of a sound into the wound would cause epileptiform convulsions of half of the body, cardiac syncope, and a more or less prolonged pseudo-coma. The importance of these pleural reflexes has been dwelt upon chiefly in connection with the subject of irrigation of the pleural cavity.

Important work relating to pleural reflexes has been done by Brodie and Russell (73) on the lungs of healthy dogs. They found the pulmonary fibers at the root of the lung and in the bronchial tubes and alveoli would respond to electrical stimulation with a more powerful cardio-inhibitory action than any other branches of the vagus. They found also that strong excitation of the pulmonary fibers, as by inhalation of formalin, acted also on the respiratory and vasomotor centers. Since they found no effect on blood pressure from stimulation of the healthy pleura except where the nerves enter the lung, Russell assumed that no reflexes arise from the diseased pleura.

Capps and Lewis (74) have performed extensive and convincing experiments on sixty dogs with normal and artificially inflamed pleuræ, and differ from Brodie and Russell in attributing the reflexes to irritation of the pleural branches of the vagus. They find that Russell's assumption is not justified, because an inflamed nerve may be sensitive to irritants to which the healthy nerve is not sensitive, and consequently the inflamed nerve may cause reflexes which the healthy nerve does not induce. A reflex of this type is pathological. In their experiments the location of the irritation was of some importance. The nearer the irritant approached the root of the lung where the fibers of the pulmonary nerves spread out, the more likely was the reflex to occur. They say: "The common drop of blood pressure and disturbance of respiration occurring when the trocar is forced through the chest wall into the cavity is probably due to injury of the parietal pleura. The reflex is usually transitory and is seen in both normal animals and in those with pleurisy. In dogs with pleurisy induced by turpentine or by oil contaminated with bacteria, excitation of the inflamed visceral pleura by mechanical and chemical irritants gives varying results. In some cases there is no marked change in blood pressure; in others there is a considerable fall in pressure that may even be fatal. These reflexes conform to two types, which as a rule occur singly, but may be combined: (*a*) The cardio-inhibitory type, in which the heart is slowed and the pulse tracings make violent excursions with a great range between systolic and diastolic pressure. Respirations also are usually slowed and may be inhibited. This type of reflex when it occurs alone is seldom fatal. (*b*) The vasomotor type, in which the pulse tracings show a steady rapid decline of pressure with-

out a great difference in systolic and diastolic pressure and frequently terminate in death. Respirations as a rule are shallow and may be rapid. In fatal cases the blood-vessels of the abdominal viscera are much engorged from acute vasodilatation. The brain shows no evidence of embolism or hæmorrhage. The cardio-inhibitory reflex is central, because it is prevented or stopped by cutting both vagus nerves in the neck. Atropine in a dosage of 1 mg. paralyzes the cardio-inhibitory fibers and destroys the reflex. The vasomotor (dilator) reflex may be central or peripheral. If central, the afferent impulses reach the medulla by way of the thoracic sympathetic, the white rami, and the cord, and not by the vagosympathetic cord. This is proved by the failure of section of the vagosympathetic cord to alter or abolish the reflex. If peripheral, the reflex goes from the pulmonary fibers to the pulmonary plexus, thence to the thoracic sympathetic nerves and downward through the splanchnics to the celiac and other plexuses in the abdomen. This reflex is more direct than the central form, but seems inconsistent with the views generally accepted as to the course and direction of impulses in the sympathetic nerves. These types of reflexes occur also in man during operative procedures upon the inflamed pleura. The cardio-inhibitory type is manifested by a slow intermittent pulse, with a great difference between systolic and diastolic pressures; the vasomotor type by a steady fall in blood pressure, without a marked difference in systolic and diastolic pressures, and by a pulse that grows steadily weaker until it cannot be felt."

ANALYSIS OF TWENTY-THREE REPORTED CASES

Of twenty-one cases whose ages are stated, eleven or fifty-two per cent. are children, the remaining ten being from 18 to 62 years of age. In six of the cases, two of which were fatal, no diagnosis is given; in seventeen, thirteen of which ended in death, the case is reported as one with consolidation of the lung, either acute, unresolved, or chronic interstitial pneumonia, tuberculosis, or compressed lung. Of the nine cases which went to autopsy, seven showed a consolidated or fibrous lung, one a compressed lung, and one a "lung useless owing to disease." Of nine fatal cases in which the duration of the illness is reported, with one exception all had been ill three weeks or more. In twelve of the twenty-three cases, there is a positive statement or proof by the occurrence of hæmoptysis or of respiratory movement of the needle that the lung was punctured; in seven others this appears possible or even probable, judging by the description, including the failure to secure fluid; in only one case (Sears) does its reporter believe that only the costal pleura was punctured; in three cases no details are given. The onset of symptoms was immediate in seventeen cases, not stated in five, delayed a few hours in only one case. The predominant symptoms in twenty-two cases are: sudden death in three; "syncope" in one; cardiac failure or vasomotor paralysis in five; respiratory failure in two; both cardiac and respiratory failure in five; coma and convulsions in four; convulsions in two. (Oliver's second case is reported without details.) This shows sudden death in three cases, vasomotor paralysis, cardiac or respiratory failure, or both, in thirteen cases, while Dayton's case 10 and the case of Mollard, Favre, and Cordier show symptoms so much like those of Russell's third case and Hamilton's second that they might probably be added to these thirteen. Cerebral symptoms — coma, convulsions, delirium, or paralyses, which have been attributed to cerebral anæmia due to vasomotor disturbance — are found in ten cases. Hæmoptysis is noted in nine cases, being alarming in three cases, and practically only an evidence of puncture of the lung in six. Of the sixteen cases in which cardiac or respiratory inhibition or vasomotor paralysis is a feature, death occurred rapidly in six, probably rapidly in one, and was deferred fifteen hours to three days in two, while six recovered. The thirteen deaths include twelve patients of known age, of which seven or about fifty-eight per cent. are children, showing only a slightly greater mortality among children than adults, as the former constitute fifty-two per cent. of the cases of known age. Of the fatal cases which had coma and convulsions only two went to autopsy, and neither of these showed gross cerebral lesions, the report being in one,

"brain vascular, few superficial hæmorrhages;" in the other, "very moderate subarachnoid and ventricular edema." The fatal cases in which the condition of the heart as observed at autopsy is mentioned are four in number, two being normal, one showing areas of fatty degeneration in the right ventricle (death in three days), and one cloudy swelling of muscle fibers (death almost immediate).

The published descriptions of symptoms do not permit definite classification of the types of reflexes — cardio-inhibitory and vasomotor — differentiated by Capps and Lewis; but the lack of anatomical evidence of complicating cardiac or cerebral lesions in some cases, the similarity of symptoms in others which recovered or were not autopsied, and the predominance of symptoms of circulatory or respiratory failure, and the immediate onset of such symptoms, point strongly to pleural reflexes as the cause of the accidents and fatalities in all the cases under review. The striking points are that in practically all cases the lung was consolidated, that the pulmonary lesions had been of considerable duration, and that in almost every case the lung was probably punctured. These facts do not, however, permit a positive conclusion, on the basis of clinical evidence, as to the site of origin of the reflex. They fail to support Russell's contention that the reflex arises in only the pulmonary fibers of the vagus and merely point to the practical conclusion that whether the reflex arises from injury of the filaments of the vagus in the visceral pleura or in the lung, the danger seems most marked in cases in which inflammatory pulmonary lesions are present. That serious accidents are rare even in these cases is shown by the generalizations of some writers who, because they have not yet encountered one of these tragedies, have rushed in where others might fear to tread. G. F. Laidlaw (75), with no accident in over one hundred cases, advises puncture of the consolidated lung for bacteriological diagnosis. T. J. Horder (76) advocates the same procedure. McAlister (77) says that puncture of the lung in chronic pneumonic conditions can do no harm and may be followed by beneficial results. M. E. Nuckols (78) makes the same claim, stating that he has always found signs of beginning resolution after puncture of consolidated lung. That still others have not seen unfavorable results from exploratory puncture merely indicates good fortune or limited observations. One sudden death is more convincing than many negative experiences.

SUMMARY AND CONCLUSIONS

Among the accidents which have been recorded as resulting from simple exploratory puncture of the pleura, a fatal outcome has been noted as a result of pneumothorax, puncture of a hydatid cyst, perforation of the diaphragm, stomach, liver, and spleen, hæmorrhage from an intercostal vessel or the lung and pleural reflexes.

The records of about twenty thousand consecutive admissions to the medical wards of the New York Hospital include one case of breaking of the needle in the chest wall, three of subcutaneous emphysema, one of puncture of an abscess of the lung followed by septic symptoms, four of hæmoptysis, one of puncture of an aortic aneurism, one of syncope, and one of death after sudden onset of grave cerebral symptoms.

From the histories of these cases and from a review of the literature, including twenty-one cases of pleural reflexes, and excluding from consideration all accidents resulting from aspiration, it is seen that:

1. *Breaking of the needle* involves the danger of the presence of a foreign body. Its prevention demands only ordinary care and skill and restriction of movement of the patient.

2. *Localized pleurisy* can not be prevented, but the pain may be relieved by strapping or local applications of heat.

3. *Subcutaneous emphysema* is rarely productive of more than slight discomfort and perhaps an alarming appearance, unless accompanied by cellulitis. It can not be prevented, but rarely requires treatment. As a complication of pneumothorax, it may even act as a safety valve, hastening resorption of air.

4. *Pneumothorax* can not always be avoided. Its importance depends upon the physical condition of the site of puncture as re-

gards the possibility of spontaneous closure of the puncture, and upon the condition of the patient.

5. *Infection of the pleura* from without may be prevented by aseptic technique, and its occurrence is probably comparatively infrequent. That from foci of infection within the body cavity can not be avoided. If empyema results the treatment is surgical.

6. *Puncture of a hydatid cyst* of the lung is a rare but serious accident. Radiographic examination might show a shadow whose rounded outline would suggest the presence of a cyst rather than a pleural effusion and favor exploratory incision rather than puncture.

7. *Puncture of the diaphragm* with peritoneal infection from an intrathoracic focus may sometimes be avoided by radiographic determinations of the level of the diaphragm.

8. Prevention of *perforation of the heart, stomach, liver, or spleen*, with possible infection or hæmorrhage calls for reasonable care as to the site and depth of puncture. Its occurrence, if the results are serious, demands an e[illegible] diagnosis, and immediate surgical treatment.

9. *Perforation of an aneurism* of the descending aorta submerged by fluid, as in the case recorded, and giving no definite signs, can be avoided only by puncturing as far as possible from the median line. In the reported case this would have been beyond the posterior axillary line.

10. *Hæmorrhage from an abnormally placed intercostal vessel* can not be foreseen. Sudden increase of pleural effusion with symptoms of internal hæmorrhage or profuse bleeding from the site of puncture requires incision and ligation. *Hæmorrhage from the lung* is shown by study of the twenty-one cases to occur most often in cases of consolidation; 33⅓ per cent. of these resulted in death. Unnecessary movement of the needle within the chest should be avoided.

11. *Albuminous expectoration*, which usually occurs only after withdrawal of a pleural effusion, has resulted from puncture, being probably due to reflex vasomotor changes.

12. *Pleural reflexes: cardiac or respiratory failure, convulsions, coma, paralyses, etc.* These result from stimulation of branches of the vagus nerve, probably in the visceral pleura, but possibly in the lung. These accidents occur most often (at least 76 per cent.) in cases with consolidation of the lung, usually due to a chronic inflammatory process.

The precautions in performing exploratory puncture of the pleura which analysis of twenty-three cases of accidents due to pleural reflexes suggests are: (1) Avoid moving a patient with pneumonia or pleurisy with effusion, especially from the recumbent to the sitting posture. (2) Avoid turning him on to the sound side. (3) Avoid excitement before the operation. (4) Use as small a needle as will suffice and avoid all unnecessary shock as this is badly borne by cases of pneumonia [Anders (79)]. A small trocar inserted through a skin incision may be safer than a needle as it is less likely to lacerate the visceral pleura and lung. It should be introduced only far enough to obtain fluid. (5) Never use the exploring needle as a labor-saving device if a careful study of physical signs will suffice. (6) Puncture cases with probable consolidation only when a definite indication for diagnosis or treatment exists, e. g., the probable presence of pus as shown by the temperature curve and increasing polymorphonuclear leucocytosis, or extreme and increasing signs of fluid indicated by displacement of the apex beat or by respiratory embarrassment. In a case beginning as a definite lobar pneumonia it is often more conservative to wait until after the crisis before exploring, unless the symptoms suggest the necessity for early operation if pus should be found. In such a case rapid resolution may remove the signs which simulate fluid. If the signs are such, however, as to prevent a clear diagnosis of the intrathoracic lesion, and empyema is suspected, explore without delay, especially in children. More lives are probably lost by delayed diagnosis of empyema than by all the accidents due to exploratory puncture of the pleura.

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CERVICAL PREGNANCY[1]

By I. C. RUBIN, M. D., New York City, New York
Adjunct Visiting Gynecologist, Beth Israel Hospital

PLACENTA prævia, according to the best authorities occurs in one out of three hundred cases. Implantation of the ovum at the isthmus, or even within the cervix is exceedingly rare, but has been proven by Ponfick (1), Weiss (2), Ahlfeld (3), Kermauner (4), Labhardt (5), Pankow (6), and Jaschke (7). The rarity of cases of cervical pregnancy would alone justify the report of another case. There are also so many clinical and anatomical considerations connected with cervical pregnancy, some of which are still mooted, that a discussion of these in the light of recent and our own studies should prove of interest.

Our objects in this paper will therefore be:

1. Report of a case.
2. Anatomical criteria which determine the cervical form of placenta prævia.
3. A discussion of the clinical features of cervical pregnancy.
4. A survey of the literature.

I. CLINICAL HISTORY OF THE CASE: (FROM THE PRIVATE RECORDS OF DR. C. GOODMAN)[2]

The patient, A. J. G., aged 28, a II para, was admitted to the service of Dr. Charles Goodman, at the Sydenham Hospital, October 2, 1910. The first child was delivered with forceps. The second

[2] Specimen and slides demonstrated (by invitation) at the New York Academy of Medicine, Section on Obstetrics and Gynecology, April 27, 1911.

[1] From the Pathological Laboratory of Beth Israel Hospital.

was born without surgical interference; patient was obliged on account of bleeding at the eighth month to take to bed. Two miscarriages; the second at seven weeks took place nine months ago. The last menstrual period was May 15, 1910. When three months' pregnant, patient was seized with pains in the lower abdomen; there was frequency of urination which lasted for two weeks. Two weeks later patient was again taken with violent pains in the right abdominal quadrant. The attack seemed to follow coitus. The pain was relieved by a hypodermic injection of morphine. One week later, following another attempt at coitus she had a similar attack, which again required morphine per hypo. These attacks were also marked by retention of urine. Patient was confined to bed and was catheterized twice daily (a glass catheter was used). Subsequently there were intermittent pains, headaches, and constipation. Another attempt at coitus then brought on a severe attack of abdominal pain and rectal tenesmus. A hypodermic injection of morphine relieved the pain; an enema was also given. The patient fell asleep, but was soon awakened by another seizure, which terminated in a fainting spell. The abdomen was distended, the pulse thready. There was free fluid in the abdomen, and the patient looked exsanguinated.

Vaginal examination. "The vaginal portion of the cervix felt enlarged and had the soft velvety feel and consistency of pregnancy. The external os was closed, and there was no visible discharge. The fornices and the pouch of Douglas felt boggy and very tender. The fundus could not be felt owing to the abdominal distension and tenderness. A diagnosis of ruptured extrauterine pregnancy was made."

"At the operation the peritoneum was full of free and clotted blood. A large, semifluctuating tumor presented in the hypogastrium, which seemed to be wedged in the pelvis. This tumor, when lifted from the pelvic cavity, proved to be a pregnant uterus. Its anterior wall was so thin that it gave at first the impression of an ovarian cyst. At the extreme left border of the anterior surface, near the broad ligament, was a rent about the size of a silver quarter. In the course of the hysterectomy while freeing the bladder, a rent was made into the lower portion of the extremely thin, almost paper-like anterior uterine wall. There was escape of amniotic fluid and a lower fœtal extremity prolapsed through the opening. In order to facilitate the technique the fœtus was extracted through the rent. At the point where the cervix was cut across it was noticed that considerable placental tissue was left behind. This was partially separated from the small portion of the residual cervix. The uterus was removed with the placenta in situ."

Pathological examination. Macroscopically the specimen consists of a uterus, adnexa, and attached placenta with a fœtus (Fig. 1). The uterus approximates in size that of a pregnant uterus at two and one-half months. It is slightly macerated owing to poor preservation in formalin solution. The hardened specimen measures 3½x4½x2 inches. In general it is seen to consist of two parts: an upper well preserved, thick muscular portion which constitutes the fundus and corpus; and a lower dilated portion to which a large shredded placenta is attached. The lower thinner portion presents two tears, one on the left side, the other on the anterior aspect. On sagittal section through the median line one is struck by the difference in appearence and thickness of the upper and lower portions of the uterus. The greater portion of the uterus is one and one-fourth inches thick, while the lower portion is one-eighth of an inch, i. e., in the ratio of 10:1. The cavity is complete from the fundus downward up to a point about 3 cm. from the lowermost end, where placental attachment is seen. The lowest dilated and thin uterine segment shows the attached placenta. The placenta is firmly adherent to the uterine parenchyma and is continuous with the greater mass of placenta, which has its amnion intact and complete. The umbilical cord has its insertion at the posterior portion of the amnion. The surface of the uterus is smooth; *the peritoneal covering extends down in front and behind to a point corresponding to the beginning of the placental attachment.* A portion of the broad ligament on either side has been removed with the uterus. The uterine vessels are easily identified and may be seen on dissection to divide into branches. *A line drawn through the points of insertion of these vessels passes through the placenta at a level immediately below its upper margin.*

The adnexa present on gross inspection nothing abnormal. The left adnexa are rather poorly preserved and have shrunk considerably.

The placenta is shredded, but presents nothing abnormal.

The fœtus (female) measures 23½ cm. in length (9¼ inches).

Microscopic examination. In order to study the exact anatomical relationship of placenta to uterus the latter was cut sagittally in the median line, and was divided into five general sections, beginning from above downward. (See figure 2.)

Section 1 shows nothing of peculiar interest. There is a moderate hypertrophy of muscle cells, increased vascularity, and lymphatic dilatation.

Section 2 and 2′. The mucosa of the fundus is somewhat thickened. The glands over a small area are seen overlying a narrow zone of distinct connective tissue. There are some "decidua-resembling" cells in the stroma, a mild leucocytic infiltration, and a widening of the lymph spaces. There is slight edema of the musculature.

Section 3 and 3′. The glands are lined by a single layer of low epithelium, are moderately hypertrophied, and present the papillary formation that reminds one of the Opitz glands of gestation. The stroma is coarse and shows a high grade leucocytic infiltration. The decidual cells are less numerous than above.

Section 4 and 4′ shows very low epithelium lining. The glands contain narrow lumena which

show the papillary character. The stroma is coarse and contains a moderate leucocytic infiltration and decidual reaction. No chorionic villi or distinct masses of decidua or fœtal cells have so far been encountered.

Section 5 and 5′, taken from the vicinity of the internal os and isthmus, shows necrotic masses of trophoblast and decidua and chorionic villi; these are deeply embedded in the musculature (Fig. 2) which is very loose. The fœtal cells have penetrated the outermost limits close on to the serosa. Some of the finest capillaries show these cells protruding into the lumen. No corpus or cervix glands are here seen.

Section 6 and 6′ embraces a small segment of the outermost portion of the uterus and the retracted thinned portion with attached placenta. (Fig. 2.) Here may be seen several glands with high cylindrical cells and basilar nuclei, characteristic of cervical glands. In the immediate vicinity of these is loose hypertrophic muscular tissue. Scattered throughout the section are large fœtal cells — irregular fusiform cells, with very pale cell body and giant nucleus, which is deeply stained. Exceptionally the nuclei are pale, though always darker than the cell body. These giant trophoblast cells, syncytium, and Langhan's cells are also grouped around and within the walls of the smaller vessels. (Figs. 3 and 4.) They are seen at the periphery of the vessel. The adventitia and musculature of a great number of these have been converted into a homogeneous structure, more or less hyaline in character, in which the fœtal giant cells are embedded. (Fig. 5.) In some places the endothelium is also missing and the giant cells lie close to the lumen. In a number of blood-vessels some of the endothelial cells present a striking appearance, both as to size and staining. They are not unlike the fœtal giant cells. When these are observed at the outer layers of the blood-vessel, the endothelium opposite them is missing. Some of the smallest vessels show a single large cell which almost occludes the lumen. There is a moderate infiltration of small round cells in the vessel walls. The muscle cells are hypertrophied. Large numbers of fœtal cells (syncytial and serotinal giant cells) may be seen lying at various depths; in some places they penetrate as far outward as the serosa. Mucous glands are for the most part absent along this area. Opposite the placental attachment at several small areas the cervix glands are retained, and are unmistakable. In marked contrast to the corpus glands, these cervix glands show the typical high cylindrical cells with basilar nuclei; the glands themselves are much larger and of the "cork-screw" type.

The placenta presents no unusual features. The villi consist of two typical layers of trophoblast and show an abundant number of syncytial buds.

Summary. In this specimen all the evidences point to an unusual low primary insertion of the placenta; in other words, an extreme degree of placenta prævia. *The presence of cervix glands opposite placental attachment establishes the cervical variety of placenta prævia.* The insertion of the uterine vessels and the lowermost points of reflection of the uterine serosa correspond to the uppermost limit of placental attachment. These facts show therefore that the placenta began its development at or very near the isthmus and internal os, and that its further evolution was rather toward the vaginal portion than toward the fundus of the uterus.

II. ANATOMICAL CRITERIA WHICH DETERMINE THE CERVICAL FORM OF PLACENTA PRÆVIA

Notwithstanding the extensive use of the term *lower uterine segment*, authorities still differ with regard to its correct interpretation and anatomical description. The isthmus uteri is similarly a matter of some controversy, especially from the histologic viewpoint. These structures which are obviously of primary importance in the consideration of cervical implantation of the placenta, have been the subject of renewed investigation since the first reported case of cervical and isthmical placenta. We shall here briefly review the anatomical relationship between lower uterine segment, isthmus, and the cervix of the uterus as well as of the internal os.

The lower uterine segment. The question of the lower uterine segment is bound up with many difficulties; Bandl originated the conception of a lower uterine segment to explain the mechanism of rupture of the uterus as occurring during labor. His conclusions were based upon the study of the gross anatomical and clinical findings of the pregnant uterus at term. He did not consider the possibility of such a structure existing in the early months of pregnancy; nor did he ever suppose that it existed in the resting, non-pregnant uterus. Recent work, however, has concerned itself with the more exact anatomical and histological study of the lower uterine segment in the pregnant and in the non-pregnant uterus. The lower uterine segment, as described by Bandl (8), is limited *above* and *externally* by the reflection of the peritoneum, *internally* by the so-called contraction ring (i. e., when labor pains have set in); *below* by the histological character of the cervix.

Functionally the lower uterine segment was supposed to represent the passive portion of the uterus during labor; the active part of the uterus was situated above the contraction ring. From even a cursory survey, it will be seen that a correct description of the lower uterine segment depends upon variable factors which are subject to different interpretation. Since Bandl, pathologists have differed concerning the origin of the lower uterine segment. Some claim that it is in part derived from the cervix and in part from the corpus, while others assert that it is contributed solely by the lower portion of the corpus. According to the first view the upper portion of the cervix is converted into a funnel-shaped canal which is formed in the later months of pregnancy. The mucosa undergoes hypertrophy and contains decidua-like cells, but not true decidua. The upper portion of the lower segment is also supposed to show a younger type of decidua than the rest of the corpus.

The isthmus. Aschoff and Ahlfeld have suggested the isthmus of the uterus as the anatomical portion from which the lower uterine segment is derived. While most pathologists are in accord with this view, the recognition and precise anatomy of the isthmus are by no means easy to establish. Is the isthmus a distinct anatomical segment of the uterus, with definite histologic features? Or is it part of the corpus or of the cervix, or of both?

Aschoff (9) and Pankow among others maintain that the isthmus is limited below by the internal histologic os and that the mucosa lining its canal is somewhat thinner than that of the corpus, and contains a smaller number of glands. The upper limit of the isthmus uteri is supposed to be at the middle portion of the entire length of the uterus (orif. intern. anatomic.). This is, however, denied by Bayer (10), Schottlaender (11) and others. Jaschke, working in conjunction with Schottlaender, never saw such a distinct area of what may be called transitional mucosa. He describes a sharp line of demarcation between cervix and corpus epithelium at the true histologic internal os. Furthermore, Büttner's (12) studies with the mucin test have shown that some of the epithelial cells claimed by Aschoff to be characteristic for the isthmus, take the mucin stain and must therefore be regarded as cervical epithelium.

It seems from the foregoing discussion that the isthmus is really an arbitrary segment of the uterus, having no definite anatomical limitations; the most positive statement that can be made is that it is situated in the immediate vicinity of the internal os. Macroscopically and for purposes of description, it is recognized as the most constricted portion of the uterus. A more accurate indication, both of this and also of the internal os, is offered by the entrance of the uterine vessels on either side. A line drawn across the insertion of these vessels would correspond approximately to the internal os and the isthmus. The lowermost points of the anterior and posterior reflection of the peritoneum are less reliable, but in the absence of the other aids, may serve as useful guides.

Histogenetic features of cervical pregnancy. The cervix normally does not enter into the decidual reaction of pregnancy, although it is claimed by Küstner (13) that the upper portion of the cervix undergoes decidual change in the latter half of pregnancy. Marchand (14) and Bayer are also of the same opinion. All are agreed, however, that the decidua is not as well developed as that of the body of the uterus.

A typical decidual reaction is, however, not absolutely essential to the embedding of an ovum. This is abundantly proven in the study of tubal and ovarian pregnancy. Furthermore the cervical form of placenta prævia need not necessarily arise from the circumstance of an ovum primarily taking root in cervical mucosa.

The ovum may wander down to the lowermost portion of the uterus, at a point near the internal os. Gottschalk (15) has observed a young ovum implanted at the internal os. At this point the mucosa is much thinner than in the upper portion of the corpus. As has been established by Peters (16), Leopold (17), V. Spee (18), and Teacher and Bryce (19), the ovum then burrows toward the musculature of the uterus. It would in this case be grafted in a bed of true decidual tissue. The ovum then expands downward and upward along the deeper structures and finally grows into

Fig. 1. Fœtus and uterus reduced to one-fifth normal size.

Fig. 2. Diagrammatic sketch of Fig. 1. a-a′, line through insertion of uterine vessels and lowermost points of reflections of the uterine peritoneum. Retr. cervix, the retracted portion of the cervix (due to formalin).

the cervical canal covered by the decidua reflexa which it has built for itself. In this early stage of fœtation the chorionic cells are most active in their penetration and wandering powers. Marchand and R. Mayer (20). According to Pels Leusden (21) this occurs in greatest abundance between the third and sixth month. The young villi take root on the opposite cervical wall and soon become firmly attached.

That the cervix can become elongated to a remarkable degree is a phenomenon observed in other conditions. The writer has in mind chiefly the unusual degree of elongation produced by cervical myoma. This fact would then allow for the accommodation of an intracervical body. If this be a growing ovum the accommodation in space cannot readily keep pace with the fœtal development.

III. CLINICAL FEATURES OF CERVICAL PREGNANCY

Placenta prævia as cause of spontaneous rupture of the uterus. Cases of spontaneous rupture of the uterus with placenta prævia are not uncommon. Rupture before full term is however, a much rarer occurrence. A. W. W. Lea (22) reports a case of rupture of the uterus at seven months. Lorini (23) reports a rupture (without trauma) of the uterus at four months. The rupture took place at the lower uterine segment. Rouffart and Delporte (24) report a case of spontaneous rupture at six months: curettage had been done eight months before the accident. In this case the diagnosis of extrauterine rupture was made. The marked trophoblast invasion at point of rupture in this case is also of interest.

Spontaneous rupture of uterus due to cervical implantation of placenta. It is not surprising therefore, to encounter a spontaneous rupture when the placenta is not only prævia, but implanted on the cervix. The difference in the thickness of the cervix wall and the corpus wall as exemplified in our specimen, indicates the enormous amount of destruction of tissue that took place in the cervix. There was no evidence of trauma or infection which may have caused the rupture. On the other hand, the very low situation of the placenta, the nature of the cervix wall which is ill adapted to hypertrophy, and to compensate for the increase of tension, the marked invasion of chorionic cells, and the resistance offered externally to the expanding ovum, are sufficient to explain the rupture.

Cause of rupture in cervical pregnancy. It is evident that, as in tubal pregnancy, beyond a certain period of the gestation either abortion or rupture takes place. The rupture is caused by two factors: one is the erosion due to syncytial invasion of the muscular wall; the second is the increase in intracervical tension.

In our specimen the amount of syncytial invasion is exceedingly abundant; and this fact

Fig. 3. Microphotograph (x60). Showing in the same field: A, a portion of a cervix gland. B, blood-vessel showing fœtal elements in its walls.

would help to explain the internal bleeding. Tension was undoubtedly released by the hæmorrhage into the peritoneal cavity at the point of rupture. The repeated attacks of syncope would perhaps indicate that the process of destruction was steadily progressing and that the trauma entailed by coitus was sufficient to renew the hæmorrhage.

Another factor in the rupture of the uterus is contributed by the bony surroundings of the cervix. Instead of growing up into the roomy abdomen where the pregnant uterus normally displaces intestines, the cervix is held firm within the bony pelvis. If a fœtus develop within the cervix the latter would eventually encounter the irresistible pressure of the pelvic bones and their promontories.

In our case the uterus is said by the surgeon to have been "wedged" in the pelvis, and this is all the more striking if it be remembered that the uterus at this stage of pregnancy, four to five months, under normal circumstances presents a large body which approaches the level of the umbilicus.

IV. SURVEY OF THE LITERATURE

Most of the reported cases of cervical placenta have been those of advanced gestation. In these cases the major portion of the placenta was intrauterine and only a lobe extended into the cervix. (Hofmeier, Müller, etc.)

According to Hofmeier (25), (Von Winckle's system, p. 1217), L. Müller states that in a search of the older literature mention is made of a number of cases in which a portion of the placenta was felt by digital examination attached to the cervical mucosa. As such observations are very likely to be deceptive, Müller (26) accepts only cases in which the findings were confirmed by autopsy. He found a series of four such cases of puerperal uteri, without, however, the placenta in situ. The diagnosis in these cases was based on the consistency and gross or macroscopic appearence of the uterus. Owing to the insufficient anatomical investigations these cases cannot be accepted as valid.

Of late years, however, there have been several publications which have dealt with the clinical as well as the anatomical investigations of the specimens. These have established beyond all reasonable doubt the possibility of an occasional placenta prævia cervicalis.

1. Weiss: v-para, 9 months. In the first three months repeated hæmorrhages. At present severe bleeding. Placenta prævia totalis. After boring through the placenta, version and extraction, one and one-half hour later, very difficult placental separation. Two days later, on account of septic symptoms, vaginal extirpation. On the anterior wall of the cervix was placental tissue till practically as far as anterior lip of external os, firmly and inseparably attached. The floor of the placenta showed degenerated musculature.

2. Küstner and Keilman (27): In a case of placenta lateralis, attempt to remove the placenta showed a tongue of placenta extending down to within one cm. of the external os, and firmly adherent to the cervix.

3. E. Ponfick and W. Ponfick report a case of a IX-para, mens. VIII. Repeated bleeding during pregnancy; placenta prævia lateralis. Metreuryse, version and extraction. Fifteen minutes later exitus from anæmia.

Autopsy. A large massive placenta which was attached, with the exception of an area three cm. wide, on the anterior wall to the entire lower uterine segment. It was unusually

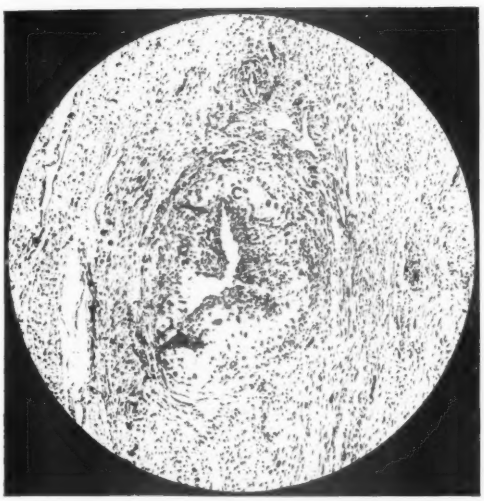

Fig. 4. Microphotograph (x150) of B, Fig. 3.

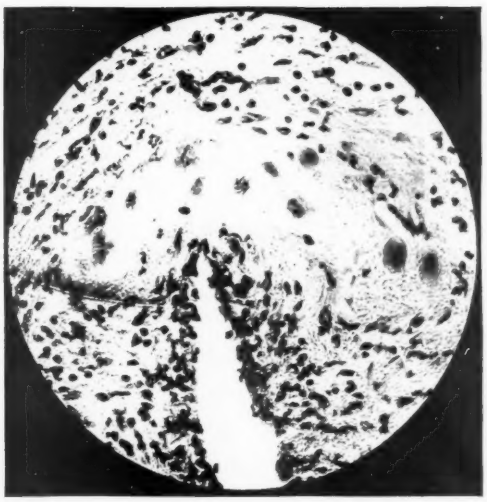

Fig. 5. Microphotograph (x900) of C, Fig. 4. Showing the large fœtal cells invading the vessel walls.

adherent so that separation was effected only by considerable force. On the left and posterior portion of the circumference for an area of four to five cm. wide, the placenta extends down along the cervix wall as far as the vaginal portion, to which it is most intimately adherent. The microscopic finding shows very marked thinning and disappearance of muscular layers. This was so marked in some areas that the placenta was said to be twenty times thicker than the musculature.

4. Ahlfeld and Aschoff report a case in which, during the early formation of the placenta a sort of splitting of the anterior cervix wall was accomplished.

5. A. Labhardt reports a case of cervical placenta in a V-para, 36 years of age. Labor was ushered in by a severe hæmorrhage. The fœtal head was engaged at the brim. In order to stop the bleeding the membranes were ruptured; the fœtus was then delivered spontaneously and lived. Crédé expression of the placenta succeeded in only partially delivering it, as it was firmly adherent. A portion of placenta six by eight cm. was left behind. On exploration of the uterus this was found attached to the anterior cervix wall within a short distance of the vaginal portion. The attachment was so firm that separation was attended with considerable loss of blood. The patient went into collapse from which she recovered.

6. Kermauner also reports a case of cervical placenta prævia. The patient, a VIII-para, 37 years old, menstruated at the end of December, 1904. At midnight of the 26th of May, 1905, without warning, she was suddenly taken with severe hæmorrhage. A midwife packed the vagina and transferred the patient to the hospital. There the patient was found in complete collapse, and appeared exsanguinated. Consciousness was retained. The uterus was found at the level of the umbilicus; no fœtal parts were palpable. The external os was dilated to the extent of a silver dollar; the cervix was practically obliterated except for a margin one cm. wide; the thick placenta was palpable. The fœtus was extracted after boring through the placental mass. Manual removal of the placenta was extremely difficult. Notwithstanding tamponade of the uterus, the patient died three-quarters of an hour later. Macroscopically the opened uterus showed that part of the placenta was attached to the cervix and extended down to within one and one-half cm. from the external os. It was situated for the most part on the anterior

wall of the body of the uterus, circumscribing the internal os and extending down to posterior wall of the cervix. Only an area of 2.5 cm. was free of placental attachment. Microscopically numerous typical cervical glands were seen opposite placental attachment, and in several areas superficial masses of decidual tissue were still retained.

7. Jaschke's case, the most recent, also contains a complete report of the pathological findings. The patient, an VIII para, 39 years old, bled in the second month of her last pregnancy. The hæmorrhage was repeated several times. During her last attack the hæmorrhage was so marked as to require tamponade. The portio was the length of a digital phalanx. The external os was dilated to the size of a silver half-dollar. Blood was streaming from the open os. One cm. above the os there projected a fine mass of rather spongy appearance. The uterus was enlarged, hard, and retroverted. Attempt to apply hemostasis failed, and vaginal extirpation had to be performed.

The pathological examination of the specimen revealed the fact that the peritoneal folds before, behind, and on the sides of the uterus coincided with the entrance of the uterine vessels. Below this point, macroscopically, there was placenta. There was only a small area of retained mucosa of the cervical canal. Here cervix glands were recognizable. The blood-vessels were numerous and the lymph spaces considerably widened. The chorionic villi had invaded the parenchyma to almost the anterior aspect, while there was an abundance of fœtal cells throughout. There were no Opitz glands, but decidual reaction was present. This, however, was to be seen only at the lowest portion of the corpus. There were no abnormalities of the musculature, only a loosening up of the cells.

Jaschke's case would seem to correspond in most details to the one we report. Our case, however, had gone on to a more advanced period of gestation. Hæmorrhage had taken place but had been concealed until finally, at four and one-half months, rupture took place with severe hæmorrhage and symptoms of acute collapse. As Jaschke remarks: "The hæmorrhage and other clinical symptoms can easily be accounted for by the corrosive action of the fœtal elements, their destructive effect on the blood-vessel walls, and the disintegration of muscular tissue." Occurring, as it does, in a portion of the uterus which is not ordinarily suited for the grafting of an ovum —the cervical form of placenta prævia may be classified for practical purposes amongst the *rarer* varieties of extrauterine pregnancy. Clinically, the outcome of a cervical placenta would correspond to the fate of an extrauterine pregnancy. Either abortion or rupture is likely to take place. As the cervix is comparatively a poor muscular portion of the uterus rupture would probably be more frequent. That this had taken place spontaneously in our case is sufficiently established by the pathological findings.

CONCLUSIONS

To prove a genuine cervical placenta the following criteria are essential:

1. There must be cervical glands opposite the placental attachment.
2. This attachment of placenta to cervix must be intimate.
3. The whole or a portion of the placenta must be situated either below the entrance of the uterine vessels, or below the peritoneal reflection of the anterior and posterior surfaces of the uterus.
4. Fœtal elements must not be present in the corpus uteri.

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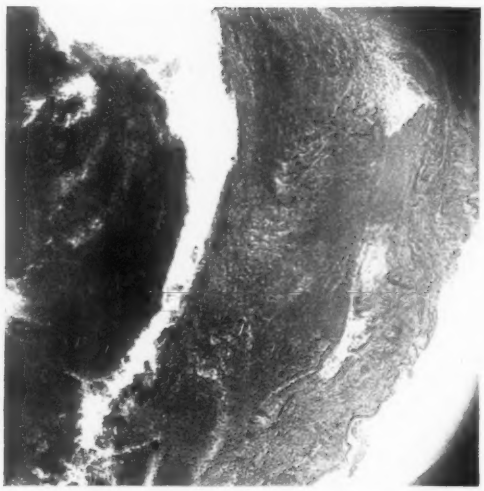
FOCAL EPILEPSY

WITH A REPORT OF SEVERAL CASES

BY A. L. SKOOG, M. D., KANSAS CITY, MISSOURI
Assistant Professor of Neurology, University of Kansas; Neurologist to St. Margaret's Hospital; Consulting Neurologist to the Swedish Hospital, Kansas City

THE title under which this essay appears includes a group of epilepsies also termed by different authorities as Jacksonian, partial, cortical, or symptomatic. The latter two do not appeal to me. Any one of the other three is not objectionable. All these terms are in contradistinction to genuine epilepsy which is greatly in the majority in point of numbers, but may be curtailed in the future, as we learn more about the pathology. Hysteria, which not infrequently has to be distinguished from genuine epilepsy, may occasionally simulate focal epilepsy.

A great controversial point is whether to include this group of conditions among the epilepsies, or not. Among the students of epilepsy, Gowers takes one extreme and would not include those focal convulsions that are caused by distinct, morbid, anatomical lesions in the brain; while Fere assumes the other extreme and would include all the conditions with Jacksonian attacks, infantile convulsions, Meniere's disease, and other allied conditions. There have been observed periodic convulsive attacks of a single group of muscles with a typical march to neighboring ones, and with no disturbance of consciousness, in which no anatomical changes of the meninges or underlying corresponding motor cortex was observed after a large exposure of the brain area. This has taught some diagnosticians to be chary of advising operative interference unless at least some slight motor weakness in the group of muscles follows the attacks. Some clinicians speak of Jacksonian attacks when referring to the convulsions of various types that so frequently occur in brain tumors. The dizziness and peculiar sensations seen in some cases of neoplasm of the encephalon are strikingly similar to the abortive attacks seen in many cases of genuine epilepsy where most of the seizures are of the ordinary type. Paresis is another organic brain disease where epileptiform attacks frequently occur. These seizures may be similar to those of genuine epilepsy, or they may be strictly focal in type without any loss of consciousness. It is a striking fact that so many cases of paresis do not have convulsive disorders, and particularly so when we consider that there is a chronic meningitis and an atrophy of the underlying cerebral cortex quite early in the course of the disease. A study of seizures in epilepsy, paresis, tumors, and other gross lesions of the brain supports the hypothesis that each individual has a certain amount of the potential elements for convulsive attacks. Some of my own animal experimentation for



(F. H.) Microphotograph. Sector of encapsulated hæmorrhage of pia deep in left precentral sulcus. Open space between capsule and hæmorrhage. (Low power. Hæmatoxylon-picricfuchsin stain.)

the production of epilepsy supports this same hypothesis.

A brief abstract of each of the three cases studied will follow. The first two were observed at the Kansas State Hospital for Epileptics at Parsons, Kan., where I performed the brain operations, and for which I am obligated to Dr. M. L. Perry. The third was seen with the family physician, Dr. John Rothwell of Liberty, Mo., and the surgeon, Dr. J. W. Perkins of Kansas City.

CASE 1. F. R., male, aged 44. Eleven healthy children. Alcoholic excesses. Struck over left parietal bone in 1900, followed by hæmorrhage from left ear, disturbed consciousness for two weeks, and other cerebral symptoms. Since April, 1910, a few grand mal seizures and many Jacksonian attacks have occurred. The focal seizures were characterized by right-sided sensory phenomena, aphasia, retained consciousness, and followed by a slight motor weakness of the right extremities.

Operation exposed the left precentral region of brain where the pia-arachnoid was found much diseased. Multiple punctures were made in the membrane and the area washed with a 1:5000 solution mercuric chlorid. Results showed no lasting improvement.

CASE 2. F. H., male, aged 27. Heredity bad. Grand mal epileptic seizures from age 12 to 21. Then Jacksonian, petit mal, and grand mal attacks. Grand mal attacks appear in which he is entirely conscious throughout, being able afterwards to relate in full detail all occurrences, and especially describing the accompanying excruciating pain. Slight right side weakness. All right deep reflexes brisker than left.

Left motor cortex was exposed at operation. Pia-arachnoid thickened, sclerosed, and yellow over ascending frontal convolution. A cicatricial mass and an old encapsulated hæmorrhage were removed from area over lower portion of sulcus precentralis. Seizures have continued.

CASE 3. O. D. E., male, aged 10. Slight trauma to right forehead near median line on October 9, 1908. A streptococcus infection developed. Diploe infected. Extension along lymphatics to meninges over right and left motor cortex. Left side, chiefly arm, focal seizures developed. Right side attacks appeared later. Consciousness always preserved.

Operations: October 19, 1908. Right supra-orbital sinus and diploe above opened. Pus found.

November 22, 1908. Trephine opening over middle third of fissure of Rolando. Pia inflamed and purulent lymphatic streaks yielded pure streptococcus culture.

December 20, 1909. Same area of skull opened Three cysts, adhesions, and thick firm scar tissue of meninges removed.

October 5, 1910. Right motor cortex again exposed. Thick, dense cicatrix in dura, arachnoid, and pia excised.

October 10, 1910. Flap lifted and operation completed over right brain.

October 20, 1910. Osteoplastic flap made over left parietal region. Pia and arachnoid engorged and markedly edematous. Brain hyperæmic.

Periods of remissions from seizures followed operations, but not a restoration. No permanent neurological defect followed the operations.

CONCLUSIONS

The three unusual cases just discussed have some points in common, but each has an individual interesting feature. In each there has been a diagnosis of focal epilepsy with pathological changes in the motor cortical area of the cerebrum or in the overlying meninges. A neoplasm was ruled out in each case.

The pathological changes in case 1 were less than in the other two, and apparently entirely confined to the inner meninges. However, there may have been slight or microscopical sclerosis extending into the cortical tissue. It is probable that the lesion had its origin 10 years earlier as a result of the severe trauma. The alcoholic habits and arteriosclerosis probably were factors in the precipitation of the seizures 9.5 years later. There may have been a predisposition to con-

vulsions in the individual. In case 2, while the lesion was of a more or less diffused sclerosing process covering much of the motor cortex, it was decidedly more evident over the face and neck centers. The age of the encapsulated hæmorrhage found deep in the lower portion of the precentral sulcus may be questioned. One might consider it of recent origin and caused by the rupture of a small vessel during a seizure. The great denseness of the capsule and its mode of tinction indicates that it was of some age, probably a number of years. The capsule with its rich cellular elements makes us think of an inflammatory cause. We know that it is customary for most cerebral and meningeal hæmorrhages to become absorbed and leave no trace except a scar or a cyst with contained debris. No blood-vessels were seen growing into the encapsulated hæmorrhage. The pathology of case 3 is difficult to analyse in a few words. It is unique in that the streptococci should have gained entrance through the diplœ and extend in a posterior direction over the motor cortex where much inflammatory granulation should result without producing a general leptomeningitis. The opposite side was likewise involved. The lesions found at the operations verified our diagnosis. Right, left, and bilateral Jacksonian attacks occurred intermingled. There was not always the classical march of muscular invasion, but they were usually partial and were probably never accompanied by any disturbance of consciousness. The pathological changes in case 3 were of a severe degree, and with agreeability we are surprised that after so many operations there should exist to-day no motor weakness.

Hereditary studies show case 3 to be absolutely clear of any taint. The ancestry of case 1 is a little uncertain. In case 2 the paternal antecedents had several tainted branches. The maternal side was clear.

There have been some cases of focal epilepsy reported where an operation revealed nothing abnormal in the corresponding motor cortex. Among the etiological factors may be mentioned hæmorrhage, encephalomalacia, trauma, neoplasm, and acute or chronic inflammation. Just why some lesions in or overlying the motor cortex should produce convulsive attacks and others not, is a problem. I have recently seen a metastatic carcinoma of the meninges with extensive invasions over the motor cortex, pressing upon the motor centers of the extremities and forming inflammatory adhesions between cortex and piamater, in which, during a long period of close observation, no Jacksonian attacks were observed. Some of my animal experimentation showed that I could produce seizures by causing lesions in the motor cortex in some animals, while in others of the same species, with the same lesions in the same locality, no seizures resulted. I believe in the susceptible soil for focal epilepsy.

The partial epilepsies may be classified into (a) vasomotor; (b) sensory; (c) motor. To the latter belong most of the cases reported, and all three of the cases which I have just placed on record belong strictly to this class.

The prognosis for focal epilepsy, although better than that for the idiopathic group, is still far from what we would wish. Many reports of cures have come out too early, in that here as well as in genuine epilepsy, several years of freedom from seizures should pass before we declare the patient restored. In the traumatic cases the earlier the operative interference after the first focal attack, the more hopeful is the prognosis. Preventive measures might be more available with a skilled neurological diagnosis at the time of the trauma and for a short period following. I quote Allen who states that out of 167 skull injuries, during the Civil War, 13.7 per cent developed epilepsy. And in the Franco-Prussian war out of 571 skull injuries that recovered, 4.3 per cent developed epilepsy, but if we add to this the cases with periodic attacks of dizziness, numbness, and trembling, the percentage is increased to 26.7.

The treatment of focal epilepsy is surgical, hygienic, and medicinal. Most of the cases after a careful diagnosis has been made, will be found to require an operation. Treatment seldom ends with the operation, for every case should be placed under the most advantageous surroundings and receive close care for several years. Motor depressants should be administered to the majority of the cases for a long period following the operation.

FIBROMYOMATA, FROM THE STANDPOINT OF THE GYNECOLOGIST AND OBSTETRICIAN [1]

By LESTER E. FRANKENTHAL, M. D., Chicago, Illinois

THE main objects of this paper are: first, an earnest plea for a more careful examination of our patients before operation, a more careful diagnosis, and especially, a more careful preparation of the patient, many times, if the condition of the blood warrants it, extending over several months prior to the operation.

Second, the use of nitrous oxid gas and oxygen for the entire operation.

Third, the effect a fibroid may have on pregnancy, labor, and the puerperium.

Fourth, the brief recital of some conclusions we have arrived at after twenty-two years of personal experience with patients afflicted with fibroid tumors of the uterus.

During the last three and one-half years we have operated nearly one hundred cases of fibroid tumors of the uterus by myomectomy or hysterectomy. The only fatal case (28769) the twelfth in the series, was in a paralytic, tubercular, bedridden hunchback, the size of the tumor so seriously embarrassing her respiration as to make the continuance of life well nigh impossible. Twenty-four hours after the operation her pulse was 92, respiration 24, the same as before the operation, temperature per rectum 100° F. Four hours afterward her temperature was 100° per rectum, her pulse, however, 148, her respirations 36. She suddenly started to froth at the mouth, became cyanotic, and died within the hour from a pulmonary embolus. This patient was treated with strychnia sulphate for three days previous to the operation, fearing just such a termination, and was finally operated against our better judgment and will as a last resort, so that we can hardly be asked to include the case in our record of mortality. That would then give us nearly one hundred cases in three and one-half years with no deaths to record that could have been avoided.

A careful examination should be made of the heart, lungs, and kidneys. The taking of a leucocyte count may give a hint as to the presence of gangrene or suppuration in the tumor, pyometria, or some complications in the tubes and ovaries. Blood pressure may assist us in determining the extent of myocardial changes (brown atrophy and fatty degeneration) or the condition of the vascular system in general. Upon the hemoglobin test we wish to lay especial stress and you will pardon us if we dilate upon this in particular by illustrating the same by a brief recital of a few cases.

Mrs. B. (31806) entered the hospital with a hemoglobin count 65 per cent. She had been treated outside of the institution for three weeks with large doses (15 grains t. i. d.) of Blaud's mass, with attention to the bowels, outdoor life, liberal quantity of red meats, raw eggs, vegetables, etc., and simply entered the hospital because she lived out of the city, in order that we might control the loss of blood during her menstrual period. When these patients with a low hemoglobin count begin to menstruate, we tampon the vagina, after preparing the same surgically, with dry cotton. This we do at once, day or night. A dressing forceps, a speculum, a basin of ½ per cent lysol water, and dry cotton is all we need. One person can do it without assistance by placing the patient in the knee-chest position. The vagina is tamponed firmly. The tampon remains in the vagina twelve, twenty-four or forty-eight hours, depending upon when it becomes saturated with blood. The tampons are renewed as often as necessary until the menstrual period is ended. When first we saw Mrs. B., her hemoglobin count was 55 per cent, three weeks later 65 per cent, and just before the next monthly sickness 80 per cent. She was then operated; in this particular case a vaginal hysterectomy was done.

Mrs. R. H. L. (30546) was treated the same way. On entering the hospital her hemoglobin is recorded as 49 per cent. Twenty-six days later her hemoglobin is recorded at 80 per cent. She was likewise operated just before the next monthly period.

Mrs. H. (36202) was admitted on the fifth of May, 1909, with a hemoglobin count of 38 per cent, reds 2,752,000, whites 5,200. She was operated on June 1, 1909. Her hemoglobin count had increased to 68 per cent. The patient was fifty-four years old, decrepit, had a large goiter, and a pulse

[1] Read before the Chicago Gynecological Society, April, 1911.

of 126 when admitted. She remained in the hospital thirty days after the laparotomy, because of the goiter and subsequent treatment by a neurologist, though she sat up on a bed rest on the fourth day and left her bed on the fifth.

Nitrous oxid gas with oxygen, given by a competent anæsthetist, seems to us to be a safer anæsthetic than ether or chloroform. The patient must not be permitted to become cyanotic, however, or else a fatal acute dilatation of the heart may ensue. We have many times kept our patients asleep from two to two and one-half hours in double breast amputations without noticing the slightest untoward result, and this without the previous administration of morphin and atropin, as advised by Teter, of Cleveland, who no doubt has had the largest experience in the administration of nitrous oxid and oxygen in this country. Teter says the patient will go to sleep quicker and take two-fifths less gas if the same is administered warm.

Ergot may hasten calcareous changes in the growth, or if pushed to its full physiologic effect, may produce gangrene, a two-edged sword to be carefully watched.

Electricity (Apoltosi) may check the bleeding temporarily, but will not do so permanently, the treatment leaves many times an infected uterine canal, endangering a subsequent operation, and never affects the growth of the uterus permanently.

With X-ray treatment I have had no experience. I know personally of two instances of atrophy of the testicle resulting in azospermie and see no reason why the ovary should not undergo a similar atrophy. This, however, could hardly account for the disappearance of hæmorrhage and atrophy of the tumor spoken of in the literature, for if my memory serves me right, even the surgical removal of the ovaries has been given up as a procedure for the relief of hæmorrhage and growth of fibroids. A fatal case of X-ray treatment is reported by Spaeth (Hamburg).

Treatment with Mammin Pöhl I will merely mention, having no personal experience whatsoever with it.

Ligation of the uterine arteries (first suggested by Gottschalk) does for a short time influence the growth of small fibroids, but in every instance in our experience at least, the collateral circulation becomes perfectly reestablished within the course of six months or so, and then the tumor begins to grow again.

To wait for the climacteric period to retard the growth or stop the hæmorrhage will in many instances prove fallacious: first, because adhesions to the bladder, bowel, or parietes will furnish abundant blood supply for growth and hæmorrhage long after the uterus would have ceased to flow, and then we must not forget that in 700 cases of fibroids reported by McDonald, thirty-five or 5 per cent became malignant, thirty-four of these thirty-five occurring after the fortieth year, and if we figure it in proportion to the number operated per age, 12.7 per cent between fifty and sixty; 23.8 per cent between sixty and seventy. And then, beside a fibroid becoming malignant, a fibroid uterus may become malignant, so that the bleeding from a uterus known to contain fibroids need not be caused by the presence of the fibroids, but may originate from carcinomatous degeneration.

Avoid, if possible, operating a bedridden patient. Embolic processes are far more prone to occur in them. Let all patients rise as soon as possible after operation, the anæmic patients particularly. Do not starve the patients before the operation and do not physic them nigh to debility. A high rectal enema the afternoon before the operation is all that is indicated. Let them drink at least a quart of fluid the day before the operation. It aids elimination. It assists the function of the skin, heart, kidneys, and bowels after the operation, lessens thirst, and no doubt, aids in the formation of phagocytes and opsonins so essential to the recovery of the patient. Shave and scrub the parts the evening before the operation but do not molest the patient by compelling her to wear a wet dressing the night before. Let her have a good night's rest. Operate early the next morning. It is better for all concerned.

So if we have decided to operate the patient, since no other treatment will eradicate the fibroid, and if we believe that the patient's conditions and chances for longevity will be improved by an operation, we next must decide which of the four operations we

wish to perform, i. e., vaginal hysterectomy, vaginal enucleation, abdominal hysterectomy, complete or incomplete, or abdominal enucleation.

We will now discuss as briefly as possible the indications for partial or complete operation, if operation be deemed advisable.

If there are many fibroids, but the bulk of them not too large to prevent an easy vaginal delivery, we ought to perform a vaginal hysterectomy, instead of attempting enucleation of the separate growths. We have but six suggestions to make in the vaginal hysterectomy:

Do not sacrifice too much vaginal wall, it may be the cause of marital infelicity.

If the uterus has to be bisected, keep in the median line, it will prevent injury to the uterine arteries.

As soon as possible, pack off the intestines by roll of gauze.

The sewing together of the opposite stumps is useless; they will ail, in the course of months retract to their normal, natural relationships (E. C. Dudley).

Close the peritoneum around the lateral stumps separately and finally in the median line.

Never operate vaginally if there be the slightest suspicion of tubal or appendicular involvement complicating the fibroid uterus.

If we decide to save the uterus, make sure that there is not present a submucous fibroid, by digitally exploring the uterine cavity The cavity can be made accessible by tent dilatation the day before the operation or by splitting the anterior wall of the uterus up to the peritoneal reduplication at the time of operation. We prefer the anterior incision to the bilateral, since in the event of tearing, the damage is less serious and the repair far more easily accomplished.

The myomectomy is performed vaginally as abdominally.

In years gone by we prided ourselves on being able to remove a fibroid centrally located, reaching as high as the umbilicus, by morcellement. To our mind it is simply a sign of technical skill, but deserves otherwise no serious consideration. The nitrous oxid anæsthesia makes the abdominal route just as safe as the vaginal and in large tumors or complicated cases far safer.

In selecting the abdominal route, we first must decide whether we wish to use the Pfannenstiel (transverse) or the median longitudinal incision. In clean cases the Pfannenstiel incision offers many advantages, especially easy accessibility. In unclean cases it ought never to be used. Our method does not differ materially from that described by Chroback and others and we will simply emphasize certain steps in the operation that we have learned to appreciate as our technique improved.

Frequently the immediate enucleation of a large tumor will make the remainder of the operation much easier, frequently the growth can be made much more accessible by ligating and severing the round ligaments as the first step of the intra-abdominal work. Again, beginning at one infundibular pelvic ligament and working right across to the other side will greatly facilitate the work in difficult cases. Bisection of the uterus as a primary step we have never practiced. We like to ligate the uterine arteries separately, one sleeps better the night after the operation. We do not use the knife that has cut across the uterine cavity again during the operation. We keep the uterine cavity from touching the bowel by a napkin pack or by a vulsella forceps or both. We sterilize it with carbolic acid and then excise the mucosa of the stump with knife or scissors and then close it temporarily with vulsella. Frequently there will be bleeding from the stump after ligation of the uterine arteries, caused by a too high ligation of the artery, that is, the stump is cut on a lower level than the artery, an anastomic branch given off below the ligated vessel has been cut and is bleeding in the stump. The most certain way to check this bleeding is to ligate the main artery again, lower down; transfixing the stump will usually, though not always, stop it, and it is essential that the stump should be absolutely dry. Two branches of the uterine artery have been known to exist. The ureters will not be endangered if the bladder is well displaced downward, and if in the event of the fibroid being of an

intraligamentary development, the same be carefully dissected out of its bed.

We insist upon covering every raw surface by taking advantage of any neighboring structure if there be loss of peritoneal covering. We turn into the folds of the peritoneum the first ligature around the infundibular ligament including the ovarian arteries, so as to leave not even the smallest bit of raw surface. We prefer to leave one or both ovaries. It prevents precipitated menopause. Since one can never, with any degree of certainty, foretell the contents of a fibroid tumor (it may be an abscess, gangrenous, or carcinomatous cavity), we have never used the corkscrew in the delivery of tumors. In shelling out large subperitoneal growths, that have undermined the bowel, great difficulty may be experienced in reattaching the bowel. No hard and fast rules can be laid down here.

If we decide to enucleate the tumors separately and save the uterus — and we have frequently done so, several times even in pregnant uteri — we prefer to incise the peritoneum a little way up around the circumference of the growth or bisect it as one would a kidney. It gives more peritoneum for subsequent covering; especially is this true if several fibroids are close to one another. Again, if several fibroids are close to one another, it may be well to make the incision in different directions so as to avoid subsequent traction of one set of sutures against the other. We make two, and even three, rows of sutures, depending on the depth of the cavity, taking great care not to embarrass the circulation by too tight suturing. The literature reports cases of rupture of the scar in subsequent pregnancies in these cases, and in one instance not until the second labor after the operation, resulting in the death of the patient. It is a matter of personal judgment to decide when to enucleate, and when to remove the uterus partially or completely. In the latter instance, we wish to say, however, that we would never be induced to remove the lubricating cervical stump on account of fear of subsequent malignant degeneration (42 cases reported recently, collected from the world's literature). If for any reason we had to remove both ovaries, we would then readily decide to remove the fibroid uterus. We never drain unless we cannot possibly cover all the raw surfaces. We prefer vioform gauze to plain or iodoform gauze, as it is less toxic. The gauze is prepared in one-yard rolls, one or two inches in width; every twelve inches are marked on the margin of the gauze with an iron dyed thread, so that the amount of gauze can be more easily kept track of, when not all of it is removed at the first dressing. We knot the first part of the gauze, put it in the Douglas and then place layer on layer as high up as the particular case demands. After the abdomen has been closed, we turn the table around, cleanse the vulvar orifice, the vagina has been prepared, or if for some reason it has not, it can be done now, hook on the cervix, draw it forward, incise the Douglas over the knot which can be plainly felt through the vaginal wall, draw out the gauze, cut off the knot, and if we expect much drainage, put a large drainage tube into the Douglas along side of the gauze.

If we were to summarize our opinion of myomectomy versus hysterectomy, it would be about this: myomectomy carries with it a greater morbidity and mortality than does hysterectomy, yet even remotely the patient's life may be placed in jeopardy by rupture of the scar or scars of a myomectomized uterus. If there are many tumors to be enucleated, the operation is of longer duration than the hysterectomy. There are many cases that ought to be operated conservatively by myomectomy, where, for instance, the patient is young, one set of the adnexa at least healthy, the fibroids few, not too many too close together, thereby sacrificing the integrity of the uterine walls, the patient's condition good for a longer operation, the patient likewise not afflicted with a chronic heart, lung, kidney, or nervous disease (epilepsy, Graves' disease, chorea, etc.) positively contraindicating subsequent pregnancy, and finally, some isolated rare cases of pregnancy complicated by fibroids — referred to in the paper — where only the enucleation of a fibroid blocking the pelvic outlet would make delivery possible.

Then if we were to give our opinion of the abdominal versus the vaginal route, it would

be this: All myomectomies that call for intraperitoneal work had better be done from above. One has better supervision of the growths that are to be removed, none is apt to be overlooked, they are more accessible, hæmorrhage is better controlled, since the uterus is in a normal position and does not become passively congested, as it does when it is turned out of the vagina. Besides, there is decidedly less anatomic disturbance by the abdominal route. The bladder is not disturbed, the vagina not shortened — in the event of hysterectomy — the lubricating cervical stump remains. In the event of adnexa tumors complicating the fibroid uterus, the operation had better be done from above, the seemingly insurmountable difficulties can be more readily overcome by this route.

This, therefore, leaves uncomplicated fibroid uteri of the size of a fist or thereabouts to be operated vaginally.

Now, just a few words about the after treatment.

About a week ago we operated a fibroid, after the list was closed however, complicated by a large twisted and adherent ovarian abscess. Bowel, ovary, and abdominal wall were intimately adherent to each other. The patient was given hypodermics of physostigmine and we thoroughly believe in its ability to prevent intestinal paralysis if only it is given early enough. Another valuable hint obtained from the foreign literature, we have found this to be, in cases giving the following history. Bowels have not moved, patient was operated three or four days ago. Patient is vomiting frequently, the vomit is bile stained, but does *not contain feces*, the abdomen not distended, but the stomach quite visibly so. This condition is caused by a mesenteric twist, strangulation of the superior mesenteric artery, due to the prolapse of the small bowel into the pelvis, causing thereby traction on its mesentery. Washing out the stomach, placing the patient over on the abdomen, elevating the foot of the bed, will in the vast majority of cases relieve the condition immediately. Flatus will pass, the bowel will move, the vomiting cease, and in less than twelve hours the alarming symptoms have passed. We can speak from personal experience in one case operated early last summer and were surprised to see the verification of all that we had read in the German literature. We let our patients sit up on the third or fourth day and leave the bed on the fourth or fifth. We are not prepared to say that thrombosis or embolic processes are thereby prevented. We have seen several cases of the former in our own observation.

We use continuous infusion per rectum of Locke solution very frequently. We use it to allay thirst, we use it where the action of the kidneys is below par, we use it where we believe the patient to be suffering from a more or less severe grade of infection. We prefer the Locke solution to the normal salt solution for the reasons given in an appended letter by Dr. Jobling, of the Michael Reese Hospital Laboratory:

"That a solution containing sodium chlorid alone is not toxic to the degree of producing death is, of course, well known, from its extensive use in surgery, but that it has not produced death does not signify that it is not toxic to the cells with which it comes in contact.

Ringer proved that the frog's heart can be kept beating for long periods on a mixture of sodium, potassium, and calcium chlorids, and he laid particular stress upon the calcium. If a frog's heart is fed with a solution containing only sodium chlorid, it beats well for a while, but the beats soon weaken and fade out. But if in this condition the heart is fed with the proper mixture of calcium, potassium, and sodium chlorid, it beats vigorously for many hours. It has also been shown that if a terrapin's heart be irrigated with blood from which the calcium has been precipitated with sodium oxalate, the heart will soon cease beating, even though the other constituents of the blood are present; normal contractions can be started again by adding calcium chlorid of the proper amount to the oxalated blood.

Loeb found that if the eggs of sea urchins were placed in water containing only sodium chlorid, they would soon die, whereas if calcium and other inorganic substances were added, they survived and became fertilized. He believes that the death of the eggs was due to the passage of the calcium and other

inorganic substances of osmosis through the cell wall into the surrounding fluid, thus depriving them of substances which were essential to their further development.

In some experimental work on cancer of small animals, I found that the cancer cells lived a much shorter period in fluids containing only sodium chlorid than in those containing also potassium and calcium, the viability in the latter solutions corresponding very closely with that noted when the cancer cells were kept in normal serum.

It is well known that physiologists in their experimental work seldom use any fluid unless it contains at least calcium, potassium, and sodium, and it seems strange that surgeons have hesitated so long in adopting a method which the physiologists have found essential in preserving physiological activities of the tissues involved in their experiments.

There can be little doubt but that in continuous rectal irrigations, considerable amounts of calcium and potassium are carried off, so that while the body may gain in fluid, it surely loses substances which are very essential to its well being.

The formula given is Locke's solution minus the dextrose, and is the one used by Carrel in his work in experimental surgery:

Sodium bicarbonate, 0.01 per cent, calcium chlorid, 0.02 per cent, potassium chlorid, 0.025 per cent, sodium chlorid, 0.9 per cent."

The rapidity of growth depends on excess of muscular tissue, the tumor growing much slower when rich in fibrous tissue. In one patient I have seen a fibromyoma grow three times its original size during a six months' sojourn in Europe.

The more intimate the growth to the uterine structure, the more rapid is its growth in the pregnant uterus.

The size of the tumor is no criterion for its age. The nearer the endometrium the more vascular. This is true of all but the polypoid growths, which frequently suffer seriously in their vascularity. Secondary effects on the circulation may be caused by menstruation, pregnancy, inflammation in surrounding structures, the climacteric, adhesions, and incarcerations.

The growth of a fibroid is expansive, it grows from its own tissue and receives its capsule from adjacent structures; there will be no return of the tumor after removal unless remnants of the fibroid are left behind with the capsule, the leaving of parts of the capsule will not be followed by a return of the growth.

Sometimes the uterus is practically driven out from the body of the patient by the weight of the tumor as in a pendulous abdomen. The cervix is thinned out, may twist on its axis and even tear off, then again the uterine canal may become so drawn out that the canal seems like a long narrow band, the mucosa atrophies completely and there is neither blood nor mucus given off from it. Then again, the cervix may become denser and obliterated, resulting in a hematometra about the closure. The subserous growth may raise up the bowel so that I have seen the transverse colon spread across the middle of the tumor.

Cervical fibroids have a more definite capsule than body fibroids, they frequently send offshoots into the surrounding structure. The cervical fibroids particularly produce bladder disturbances, compression causing retention, dribbling of urine and then they frequently displace the bladder so that there is great danger of injuring it at the primary abdominal incision.

Diffuse fibrosis is usually superinduced by an inflammatory condition of the uterus, and as the name implies has no capsule. The seat of fibromyoma is usually in the body of the uterus. Only about ⅓ per cent to 5 per cent of the fibroids are found in the cervix. Multiple cervix myomas are still rarer, myomas of portio vaginalis are most rare. At times it may be difficult to differentiate between an inversion of a uterus and a fibroma of the portio vaginalis (case seen in consultation with Dr. Banga).

That fibroids may develop primarily as a submucous or subserous variety, is evidenced by the fact that very small fibroids are found with no muscular covering over them but simply mucous membrane or peritoneum.

Uterine polyps frequently receive a good share of their nutrition through the vessels contained in the uterine mucosa. These vessels are frequently entirely compressed during the spontaneous birth of the polyp,

causing necrosis of the polyp from lack of nutrition and ischæmia. The nearer the surface the original site, the more apt are they to become polypoid or pedunculated. Polypoid fibroids at times become isolated from the uterine structure.

One symptom in connection with submucous fibroid I wish to call particular attention to, and that is a patulous cervical canal and external os. With me it is always a sign that there is something in the uterine body that does not belong there, and it usually turns out to be a polypoid fibroid, in the absence of symptoms of pregnancy.

The original habitat and the amount of resistance determines whether an intramural fibroid shall become subserous or submucous, the muscular covering frequently atrophying and giving way.

The only completely detached fibroids that I have encountered in my operative work have always been of the intraligamentary variety, and strange to say, have always been situated on the left side. No doubt, the looseness of the cellular tissue in the broad ligament favors the rapid expulsion of the fibroid into the broad ligament, and perhaps the action of the rectum and sigmoid materially assisted in its becoming detached. Of course, detached fibroids have been found in the abdomen and in the uterine cavity.

Fibroids are usually either round, pear-shaped, oval, or lobulated. Muscular action, bony resistance, proximity to other fibroids, and finally connective tissue bands contained within the fibroids may influence the shape. The latter then look like a brain (R. Meyer).

The more muscular tissue the fibroid contains, the redder in color it will be; the more connective tissue the paler, the whiter. The more muscle tissue the softer. Especially true is this of myomas that are wedged in and become edematous, making it at times impossible to differentiate between a fibroid and a cyst.

The large blood-vessels run in the connective tissue septa and send branches into the tumor proper, myomas being less vascular then fibromas. The adventitia is said to be absent and the media, therefore, in direct contact with the structure of the growth. The very small fibroids do not contain any vessels, and very small vessels no matter where found frequently have no adventitia, so this can hardly be considered pathognomonic of fibroid vessels. Robert Meyer, whom I look upon as the highest authority in gynecological pathology, says that the vessels have nothing whatsoever to do with the formation of a fibroid. He says fibroids occur only after several small hyperplastic muscle cells have started to segregate. Some pathologists claim, you know, that the vessel gives up its adventitia to the tumor mass. Nerves are present only in so much as they are included from the normal tissue that has been taken in, to form the tumor, otherwise they are absent.

The degenerative changes are as numerous as pathology can furnish. For the purpose of completeness, it will suffice merely to mention them: they may be fibrous, atrophic, fatty, chalky, bony, hyaline, amyloid, myxomatous, necrotic, suppurative, cystic, malignant, angiomatous, and lymphangiectatic.

Fibroids may be complicated by a tubercular, carcinomatous, or sarcomatous process in the uterus. Schmorl claims uterine fibroids are the favorite metastatic site of malignant tumors, and quotes the breast, stomach, ovary, cervix, and peritoneum as the primary sites of these growths. The peculiar cachectic look of the patient with a large ovarian tumor I have never seen in fibroids, no matter what size or how serious the symptoms.

Twisting may occur from the pedicle of the fibroid and will involve the fibroid only, unless the pedicle is very short, and is situated in the cornu of the uterus. Then the uterine substance will be gradually drawn into the twist. Torsion of the uterus itself may occur through rotation of the fibroid and it may cause the uterus to turn anywhere from ninety to three hundred and sixty degrees. The symptoms of torsion of the fibroid per se or with the uterus are sudden, intense pain, nausea, vomiting, bladder symptoms, crepitation or crackling, peritonitis, etc.

The uterine bruit heard with fibroid tumors is either from the ovarian or uterine arteries or from the large vessels covering the tumor;

it, however, never comes from vessels in the tumor, unless the same has undergone an angiomatous change.

Intraperitoneal hæmorrhage from rupture of vessels in pedicle or covering of fibroid is very rare. Not more than a dozen cases are known in the literature. I have never seen one. Jaschke, Rokitausky, Perrier, Gusserow, Zweifel, Stein, Clark, and Spencer, have reported such cases.

Whether fever cannot exist without the presence of micro-organisms in a necrotic myoma, I am not prepared to say from personal experience. I do, however, know that fever does exist in a twisted ovarian tumor in the absence of micro-organisms. I see no reason why the absorption of toxins might not cause the temperature long before micro-organisms have invaded the necrotic growth, either through its communication with the uterine cavity or through adhesions to the bladder or bowel.

Constitutional diseases and complications, such as diabetes, albuminuria, pneumonia, typhoid, tuberculosis, valvular heart lesions, ascites, appendicitis, extrauterine pregnancy, and uterine pregnancy, I have encountered several or many times. I cannot see that the course of any of these diseases or afflictions are in the least interfered with, except mechanically through the pressure of the tumor. To some of them I will return and give my present views.

Differential diagnosis with ovarian tumors, parametritis, exudates, pregnancy, are at times impossible; at times all of them are present.

The history and the local findings, however, usually suffice to make a correct diagnosis.

The uterine mucous membrane may be either atrophic or hypertrophic. I have already spoken of the ribbon-like endometrium due to traction being one of the causes of atrophy. Then there is another cause of atrophy, namely, where a large submucous fibroid pushes the endometrium ahead of it as it were; and then finally the endometrium may atrophy in "spots" from pressure of an opposing fibroid. If these conditions do not obtain the endometrium may be either normal or hypertrophic, principally the latter.

In my experience I have found the ovaries either normal or hypertrophied, edematous at times, containing thrombotic vessels, not as is claimed by some authors, atrophic. The same changes are found in the tubes unless otherwise diseased (gonorrhœic). I always leave them or as much of them as possible, intact, if there is no apparent pathology.

The uterine musculature is usually hyperplastic, sometimes several inches in thickness.

Uterine stones I have never seen. They are, of course, calcareous fibroids passed through the uterine canal.

In this series of cases no malignant degeneration occurred though I have had two sarcomatous degenerations, both demonstrated before the Chicago Gynecological Society.[1]

Whether the cervix should be removed with the remainder of the uterus, remains to be decided, not only by the locality of the growth, but likewise by the question of malignancy. In any event, should the cervix have been left behind, and should a malignancy have been discovered in the growth after the operation, the cervix could then be secondarily removed.

Operation for multiple troubles,—gall-stone, appendix, or what not, complicating the fibroid—I have no patience with. I deem it a nefarious practice.

I have seen a fibroid disappear (case Miss K., sister of Mrs. A.) without any treatment.

Rotary hospital service may be the cause of some deaths, for surgeons will not take the necessary time to prepare a patient, since many times this preparation would extend beyond their term of service.

I rarely see a case of cystitis, first because I let patients sit up. They can, therefore, urinate spontaneously and then when I have to catheterize, I catheterize under running boric solution.

Postoperative complication. Ileus, duodenal mesenteric twist, postoperative hæmorrhage, injury to neighboring organs such as the bladder, bowel, ureter, thrombosis of veins of lower extremity, embolus, are more or less met with, but no doubt far less fre-

[1] Proceedings of the Chicago Gynecological Society, 1901–1902, p. 156, shows the report of one, and the other I could find no record of in the Society proceedings.

quently in the last years than formerly. Why I do not know, unless it is due to the splendid team work done by the nurses in the preparation for and during an operation, the simpler and safer methods of preparing the patient, especially the heart, blood, and gastrointestinal tract, the universal wearing of rubber gloves, and finally, gas and oxygen anæsthetics.

Albuminuria may have existed before, may exist coincidentally with, or may be caused by the fibroid. Given a case of albuminuria, the question to decide is not so much, which one of the three above conditions obtains, as the kind and extent of kidney involvement and the possibility of operating with a chance of not only removing the tumor but likewise improving the kidney lesion, at least not making it worse. Nitrous oxid gas with oxygen ought to be the anæsthetic. Diabetics I have operated after proper preparatory treatment, with unusually good results.

Ascites I have found principally in very hard (calcareous) irregular fibroids, no doubt due to the irritation of the peritoneum from the fibroid, unless other complications were present to cause the ascites.

Myocardial changes I have frequently met with and believe, with others, that they are due to the growth and hæmorrhage, notwithstanding the recent literature to the contrary. The changes are principally brown atrophy and fatty degeneration. Inversion I have never seen.

Virchow claimed that fibromyomata must be due to local irritation. Cohnheim furthers this theory in claiming that it is due to an irritation of embryonic structure and Ribberts enlarges upon this by claiming that it must be an extrauterine irritation of this embryonic structure; an isolation by force or through connective tissue bands of muscle structure taking along with it epithelium, beside remnants of the Gärtner's duct and separated Müller's duct.

I know of one family where the mother died of carcinoma of the uterus and five daughters were operated for fibroma of the uterus, two by Dr. Henry Banga, two by myself, and one by Dr. Banga and myself. Only one of the daughters was sterile and I believe in her instance the cause of sterility must be laid at the husband's door.

Veit suggests that irritation of the endometrium, hyperplasia in cases of endometritis, in abortions, may be an etiologic factor, in combination with the Cohnheim-Ribberts embryologic theory.

If a woman having a fibroid in her uterus has become completely climacteric and then sooner or later begins to bleed again, it should arouse strong suspicions of malignancy.

The symptoms very much depend upon the location of the growth, polypoid and submucous varieties causing most hæmorrhage, interstitial less, and subserous hardly ever any into the uterine cavity. Hæmorrhage may occur as a menorrhagia or as a metrorrhagia. Very irregular flowing points toward the tumor growing pedunculated.

In fibroid patients, pain is labor-like during the movements and birth of the tumor. Pain may likewise be caused by incarceration, by pressure, rapid growth and stretching of the covering of the tumor, degeneration, such as necrosis, suppuration, etc.

Fibromyomas of all sizes, and no matter where situated, may cause absolutely no symptoms; then again, fibroids may cause hæmorrhage, neuralgia, edema, obstruction to bowel and bladder, interference with respiration, pressure on kidneys and stomach. Peritoneal symptoms from localized inflammation and adhesions may ensue.

The co-existence of pregnancy, labor, or the puerperium, with a fibroid tumor and the many complications that may arise therefrom, are so serious, so interesting, and may, among experienced and well-balanced medical minds, give rise to such widely diversified opinions, that this chapter might form a paper all by itself; but I have decided to include it in our discussion.

To begin with, I cannot understand how any one can ever aspire to arrive at an even approximately correct conclusion of the causes of sterility in women afflicted with fibroids. The mechanical causes, to my mind, at least obtain in a very few cases only. Male or marital sterility play, no doubt, a great part. Those of us who see not only gynecological, but obstetrical material as well, see

annually a proportionately large number of women whose pregnancy is complicated by fibroids of more or less size. Scipiadis gives general fertility as 4.2 per cent, with fibroids without symptoms, 2 to 3 per cent, with fibroid with symptoms, 0.01 per cent.

Conception may be interfered with, on account of difficult coitus, the fibroid blocking the vagina, or the passage of the ovum, or the fecundated egg may mechanically be hindered by the tumor. Some years ago I showed a specimen here where a small fibroid blocked the way of a fecundated ovum from the tube, causing an extrauterine pregnancy. The entrance of the spermatozoa into the uterine canal may be checked by the tumor or by the excessive amount of flowing and increased secretion from the hyperplastic endometrium. It is but fair to state that at times it is well nigh impossible to prognosticate the effect a fibroid will have on pregnancy, but that pregnancy, labor, and the puerperium are many times seriously interfered with and will vary considerably from the normal is certain, since I have seen the most unexpected dystocias from body fibroids and the most surprisingly easy deliveries in cervical fibroids (case of Dr. Banga in 1885). I would even be unwilling to prognosticate the outcome of a pregnancy in cervical as against body fibroids, though roughly stated, the cervical fibroids ought to produce the more serious complications.

Actual cessation of labor, once begun, may occur from the rigidity of the lower uterine segment and cervical canal. Tumors reaching into the lumen of the pelvis, unless they become favorably dislodged downward or upward or become flattened out like a mushroom, may block the passage of the presenting part. Just like in a contracted pelvis, abnormal positions, deflections of the fœtus, prolapse of small parts or the cord, or an atypical third stage of labor may occur.

Seligman reports a unique case where in the fourth month of pregnancy a fibroid presented in the vagina. It was removed and pregnancy continued to the thirty-eight week and was concluded by a normal delivery.

This brings us to the most serious of all complications during pregnancy, namely, when fibroids become loosened in their capsules, during labor, or especially during the puerperium, with all the sad consequences ranging from abortion, hæmorrhage, and retention of the lochia, to inversion, suppuration, necrosis, gangrene, sepsis, and death. This is no exaggeration; I have seen two patients die during the last year from just such complications and would not in the future hesitate to at once remove the entire uterus rather than temporize by removing separate fibroids, leaving an infected site or endometrium to be followed closely in its wake by sepsis and death.

During labor a very interesting possibility, and one rarely observed, and still more rarely recorded, is the loosening of the fibroid from its bed, its displacement, after the partial emptying of the uterus, blocking—like the interlocking of twins—the further progress of labor.

Incarceration of the fibroid, torsion of it including the pregnant uterus, may produce serious dystocia. A very interesting paper was read but a few months ago on the subject before the Michael Reese Hospital Medical Society by Dr. Stuhr, citing several cases that had occurred in my service of just such a character.

Speaking of body fibroids not complicating the course of pregnancy,—and you will see this statement quite frequently in the literature, and hear it in consultation,—I am reminded of a case I saw with Dr. D. Williams, operated at the Provident Hospital, where the growth of the body fibroids was so rapid and excessive that he was compelled to remove the fibroid uterus on account of the dyspnœa, cyanosis, and tachycardia due to the high position of the diaphragm, which in turn was crowded upward by the immense tumor.

Fibroids, at times, for some reason, grow so rapidly that they may cause symptoms of incarceration, becoming edematous, cystic, or gangrenous. This may occur during pregnancy or (and this is especially true of the gangrenous degeneration) during the first days of the puerperium, during involution of the uterine substance.

Von Franque reports five cases from his clinic of necrosis of fibroids during pregnancy

or the puerperium. It would be well if we all reported our cases; then we should soon arrive at more definite data as to the seriousness of fibroids in pregnancy.

Fibroids frequently shift their relative position or site during pregnancy and this is especially true about the twelfth to sixteenth week of pregnancy and during labor itself. They may then cause abortions, incarceration of the pregnant uterus, pressure symptoms on the rectum, ureter, bladder (and as previously mentioned, in the non-pregnant state) kidney complications, neuralgia, edema of the lower extremities.

I have kept cases under observation for a week at a time before I could definitely diagnose the complication of pregnancy. Fœtal movements, long before fœtal parts could be felt, have been of great assistance in definitely settling the question.

The irregular contractions of the uterine body are somewhat misleading in this respect since they do occur and have frequently been observed by me in uterine fibroids uncomplicated by pregnancy. There is, however, an appreciable difference to be observed in the rapidity and magnitude of the contractions —the quick interchange from relaxation to contraction in the pregnant and in the non-pregnant uterus.

I have in some few instances emptied the uterus early in pregnancy, when the site of the fibroid or the number betokened a serious complication at the end of pregnancy or during labor, and when the patient refused operation for the fibroid condition. When this consent can, however, be obtained and when for some reason or another, it was deemed advisable not to wait for the end of pregnancy, I have frequently removed the pregnant uterus and fibroids en masse.

If the placenta happens to be inserted over the fibroid it may become adherent or partially or completely detached, causing terrific hæmorrhages (case of Dr. Braude) or in some of the adherent placentæ the separation may be well nigh impossible. Fatal hæmorrhage may however occur without an adherent placenta complicating the third stage of labor (Medic. Klin. 1909, Hartog). Hoehm claims that the motion of the cilia in a myomatous uterus is more intense than in the normal uterus on account of the hyperplasia of the mucosa, hence the comparative frequency of low insertion of the placenta in thes cases. Low insertions of the placenta occur quite frequently, v. Winckel states in about 3.5 per cent.

In the last four years Olhausen lost eight cases from hæmorrhage during labor out of 143 that occurred in his clinics. One of the eight, therefore, 12.5 per cent, died through atony of the uterus on account of the multiple fibroids contained in its walls. The conclusion that I have arrived at from my own experience, is that fibroids are a serious menace when complicating a pregnancy, and so far as I am concerned it will in the future be an indication to operate even when the fibroid produces no symptoms.

Myomectomies I have likewise done and without interruption of pregnancy in quite a number of cases and in one instance this operation was complicated by the removal of a large ovarian cyst with no untoward result to the pregnancy (Mrs. E.). Let me state here that I keep these patients profoundly under the influence of bromids, beginning immediately after the recovery from the anæsthetic and continuing for at least one week after operation. In another instance I came so close to the uterine mucosa that I feared perforating the same in my first tier of stitches. This patient is going on to full term and is to be delivered in a few weeks (Mrs. B.).

If we are now to consider what to do this would be my summary. If not in labor, I should consider the advisability:

1. Of leaving things as they are, waiting for labor.
2. Myomectomy.
3. Hysterectomy.

If in labor:

1. The manual replacement or displacement of the growth.
2. The advisability of removal of the growth if it blocked the way, with or without Cæsarean section (Porro).
3. Instrumental delivery.
4. Cæsarean section without interfering with the growth.

5. If an infected uterus, the removal of the uterus and fœtus "en bloc."

6. Removal of the submucous growth or growths after labor, if I did not fear sepsis.

7. Removal of the uterus after the completion of labor if I feared sepsis.

At best, the prognosis ought to be conservative, even though the percentage of dystocias must be low in the units. One can never foretell the outcome of a case of pregnancy complicated by a fibroid tumor of the uterus, if I am to judge by the many surprises and disappointments I have met with during the last twenty-six years.

We have endeavored to give a brief recital of our personal experiences with fibroid tumors of the uterus during the last twenty-two years. We have kept in mind the fact that we were addressing colleagues, themselves experienced in the field of surgery, and we have, therefore, merely dwelt upon certain salient features that have come to us personally, wishing thereby to elicit an animated discussion from the members present.

SURGICAL PATHOLOGY OF THE PROSTATE[1]

A Review of 468 Cases

By LOUIS BLANCHARD WILSON M. D., and BERNARD FRANCIS McGRATH M. D.

From the Laboratory Department, St. Mary's Hospital, Mayo Clinic. Rochester, Minnesota

OUTLINE

1. Introductory.
2. Anatomy.
3. Physiology.
4. Pathology.
   - *a*. Infections { acute. / chronic.
   - *b*. Hypertrophy { etiology. / pathologic anatomy.
   - *c*. Atrophy { etiology. / pathologic anatomy.
   - *d*. Concretions.
   - *e*. Neoplasms.

INTRODUCTORY

We have recently re-examined the specimens and reviewed the data from all cases of operations on the prostate in this clinic from October 28, 1904 to June 1, 1911. The series, comprising as it does 468 cases, is large enough to warrant placing the observations on record for comparison with the conclusions of other observers.

Since the publication of the studies of Young, Geraghty, and Stevens in 1906, the only comprehensive memoir which has come to our notice is that of von Frisch, 1910. Therefore we deem it advisable to review in this paper the essential points in the anatomy and the physiology as well as the pathology of the gland. In thus adding to our own observations a somewhat full review of the data and discussions of others concerning the normal and the pathologic conditions of the prostate, we hope not alone to stimulate interest in this organ, but also to place in convenient form the more important facts and theories concerning it, as a basis for future studies.

ANATOMY

Many and excellent descriptions of the prostate are to be found in the literature, but in spite of that fact, there still remain some details of the normal organ too little known, and even the most recent investigations, through which anatomic facts of surgical importance have been contributed to our knowledge, are admittedly incomprehensive.

Embryology: During the third month of fœtal life the mesoblastic tissue surrounding the lower ends of the Müllerian and Wolffian ducts becomes differentiated in association with a thickening of the wall of the primitive urethra. Simultaneously with this, the epithelium of the sinus urogenitalis throws off three groups of buds (Pallin) on each side. Two of these are on the dorsal aspect of the urethra, beginning as one mass and later dividing into a cranial and a caudal group. One is on the

[1] Read before the Section on Pathology and Physiology, American Medical Association, Los Angeles, June, 1911

ventral aspect of the urethra. This develops but slightly, or later, atrophies, so that in the adult organ it is often almost absent. These buds consist initially of solid cordons of epithelial tissue which penetrate into the annular mass of mesoblastic tissue surrounding them. The glands do not acquire a lumen until after birth.

Position: The prostate surrounds the most posterior portion of the urethra, consequently, lies before the bladder. According to Kohlraush and Luschka, when two straight lines are drawn from the tip of the coccyx, one passing to the superior border, the other to the inferior border of the symphysis pubis, the upper touches the base of the prostate, the lower its apex. Posteriorly the gland borders upon the anterior rectal wall, to which it is connected by scant, tense cellular tissue, poor in fat. The anterior surface is separated from the symphysis pubis by a space of 15 to 11 mm. gradually increasing from above downwards, filled chiefly with fatty cellular substance and a dense venous plexus.

Shape: Excepting the posterior smooth surface, which is covered with Desnonvillier's fascia, the gland is in closest union with its surroundings. The prostatic tissue is continuous backwards and outwards with the vessel-bearing and thickened portions of the pelvic fascia, whereas the lateral borders are only artificially separable from the pelvic fascia and the plexus Santorini. A portion of the bladder musculature radiates into the base of the prostate (basis prostatæ) and the apex is continued uninterruptedly forwards into the external sphincter (sphincter urethræ externus—Henle). Consequently, in describing the shape, the gland must be separated from its surroundings. Thus isolated, the prostate is usually depicted as "chestnut-shaped." Geometrically it is an oblate conoid, with the base directed upwards and the apex pointing downwards and forwards, resting on the triangular ligament (diaphragma urogenitale).

Size: While its dimensions vary, the following may be taken as fair averages for the white adult: Base to apex diameter, 33 mm. to 45 mm., average 34 mm. Transverse diameter, 34 mm. to 51 mm., average 44 mm. (This diameter is usually one-fifth to one-fourth more than the base to apex diameter of the same gland.)

Thickness: 13 mm. to 24 mm., usually 15 mm.

Weight: 13.7 to 21.3 grams, average 16 to 17 grams.

For comparative purposes, all adult prostates weighing under 16 grams may be considered abnormally small, all weighing from 16 to 24 grams, normal in size, and those weighing 24 grams or more, as abnormally enlarged.

Subdivisions: For the sake of order, we shall divide this description of the prostate into the intraurethral and the extraurethral aspect. Intraurethral aspect: Situated approximately in the middle of the posterior wall of the pars prostatica urethræ is a longitudinal elevation about 3 mm. high and composed mostly of cavernous tissue—the colliculus seminalis (caput gallinaginis, veru montanum). At both extremities it gradually declines, disappearing above towards the bladder, below towards the pars membranacea urethræ as a ridge of mucous membrane. On the anterior declivity of the colliculus is a fine slit-like opening, the exit of the utriculus masculinus (sinus pocularis, vesicula prostatica, rests of the Müllerian ducts, analogue of the uterus).

The utriculus masculinus is a longitudinal, pear-shaped pouch, extending backwards and upwards, and ending between the ejaculatory ducts. Normally, it is 10 to 12 mm. long, covered with mucous membrane and supplied with a muscular layer of circular fibers. In some cases the length of this pouch is considerably increased and then it projects as a blind sac beyond the posterior surface of the prostate.

In the middle of the posterior urethral wall, and situated on the right and left borders of the colliculus seminalis, are the two exits of the ductus ejaculatorii (ductus deferentes). By these two openings the pars prostatica urethræ is divided into a proximal and a distal portion. On both sides of the colliculus are located the exits of the prostatic ducts which belong to the lateral lobes. On the posterior urethral wall, and proximal to the colliculus, are to be found the excretory ducts of the middle lobe. On the anterior urethral wall, opposite the colliculus, the variable, sparse excretory ducts of the anterior lobe end.

Extraurethral aspect: In describing this phase, two portions of the prostate are to be differentiated from each other, the glandular (glandula prostatica) and the musculoconnective tissue portion. Instead of a strictly morphologic classification, the prostate has been rather commonly subdivided according to its external form alone. Thus we see the gland described in the literature as composed of anterior lobe, posterior lobe, middle lobe, and lateral lobes. Such a description ignores the organic divisions, the zones of glandular distribution. The lobus medius has been designated as the "so-called middle lobe," disregarding its morphologic and embryologic independence. An exact comprehension of the glandula prostatica could only be acquired by freeing the gland, with its lobes and lobules, from the surrounding musculature. Thus defined, these glandular lobes, which not only present agglomerations of lobules, but also prove the intimate relationship between the lobules of each individual group by the fact that their excretory ducts open in common at a definite place on the urethra, are to be designated prostatic lobes in the strict sense. Consequently, following this principal of classification, the glandula prostatica, more or less independently of its outer form, consists of two symmetrical peripheral lobes —the lateral lobes, an interposed middle lobe, and a small anterior lobe.

The embryology of the prostate supports the correctness of this principle. It teaches that the budding for the origin of the lateral lobes is present on

both sides of the elevation of the colliculus, that for the middle lobe takes place proximal to the colliculus, and the ventral wall of the embryonic urethra sends forth the glandular buds for the anterior lobe (Pallin, Evatt). It is evident that this mode of view is somewhat schematic, since the relations of these glandular groups are complicated in so far as the lobules belonging to the middle lobe are found, more or less, on the lateral borders of the urethra, whereas, in other cases, these lateral portions belong undoubtedly to the lateral lobes.

From the posterior aspect the prostate is a bilobular, bilaterally symmetrical organ. The lateral lobes, which are slightly convex on their posterior surfaces, are separate until about the fourth month of embryonic life. During the fifth month they are combined both anteriorly and posteriorly. Viewed from the side, the retrourethral portion presents a much greater sagittal diameter than that in front of the urethra. The posterior side of the gland possesses the greatest surface-dimension. Here is seen a longitudinal furrow, for the most part shallow, which is transformed above into a flat notch (incisura prostatæ) in the juncture of the posterior and superior surfaces. Coming from above, the ductus deferentes and the vesiculæ seminales disappear at this notch into the prostate. The gland is pierced by two canals; one contains the urethra, canalis urethralis prostatæ, the other the ductus ejaculatorii (ductus deferentes), canalis deferentialis prostatæ. These two canals, which are united in the middle of the prostate, are separated from each other by the middle lobe. Behind the canalis deferentialis both sides of the prostate are united by a very narrow strip of tissue, the upper end of the so-called lobus posterior prostatæ. Therefore, the proximal portion of the urethra is only in contact with the middle lobe, and the distal portion is alone in connection with the longitudinally extended posterior lobe—perhaps better termed the posterior commissure. The upper end of this latter structure does not come in contact with the trigonum of the bladder. The middle lobe is separated laterally from the peripheral portion of the gland by a variably well developed layer of muscular fibers.

The glandular portion: This consists of agglomerations of glandules, each possessing a special excretory duct, whose number has been variously estimated (Kölliker, 30 to 50; Hessling, 15 to 30; Luschka, 16 to 25). Svetlin, using an ingenious method for counting the excretory ducts, reckoned their number 15 to 32. Some anatomists describe these glandular units as terminal, others as an alveolar type. Section at any level shows both alveoli and ducts. The tubular ducts begin branching about one cm. from their outlets. After frequent subdivisions they form terminal alveoli. Along the course of the ducts are numerous sacculated diverticula—the duct alveoli—which greatly increase the amount of secretory epithelium. Some observers state that the alveoli intercommunicate. Certainly they frequently show more or less infolding of their walls. This may be due to their contraction, that is, a result of contraction of the prostate, or it may be explained as due to an irregular expansion of the tubes and alveoli at the expense of the interstitial tissue.

We have never seen a tunica propria about any of the alveoli, which agrees with the observations of other recent workers. Instead, the epithelium rests directly upon the smooth muscle or fibrous connective tissue.

Whereas in the alveoli of the adult prostate a double layer of epithelium is frequently noted, it is an open question whether such a formation is normal or not. Krause says: "The ducts and acini are lined with a simple layer of cylindrical epithelium. Between the bases of each two cells there is inserted a round or conical supplementary cell." Langerhans states: "In all alveoli a double layer of cylindrical epithelium is present." The cylindrical epithelium lines the glands throughout except near the orifices of the ducts, where transitional epithelium similar to that of the urethra is present.

The musculoconnective tissue portion: No other genital organ nor other viscus encloses within itself so great a number of muscular fibers in such a limited area as the prostate, especially where the glandular substance is subordinate to the muscular layers (Rüdinger). In this stroma, which is composed of smooth-muscle cells and also numerous elastic tissue fibers, the secretory part of the prostate, the genuine glandula prostatica, appears. Although the greater part of the muscular element consists of very fine non-striated fibers, still striated fibers are also present in the external sphincter and between it and the internal sphincter, on the anterior surface of the gland. Here their function appears to be to approximate the margins of the prostate. The sphincter urethræ internus is composed of smooth-muscle fibers and is situated on the upper border of the gland, in close union with the urethra It forms a massive ring, with its retrourethral portion more thickened than its anterior semiring. The internal sphincter is an integral part of the prostate and functionates as a powerful sphincter muscle of the bladder. This view of the sphincter urethræ internus is supported by recent anatomic investigations (Frisch, Thompson, and Walker). In the interior of the prostate is a dense fibromuscular mass surrounding the urethra. Spreading out from this mass in all directions are muscular bands consisting of transverse and longitudinal fibers. While these usually follow the connective tissue framework, in many places they constitute by themselves the interalveolar septa, without admixture with any discernible fibrous tissue. Here and there they form circular or looped structures, which embrace the glandular lobules. Besides the fibromuscular and elastic tissue, the organ possesses thinner connective tissue partitions, and thereby the parenchyma is divided into its lobules.

The peripheral surfaces of the lobes are covered with a layer of muscular fibers varying in thickness.

These muscular fibers radiate towards the bladder and towards the ospubis, and may be designated as "superficial layer" but not as capsule proper.

The anatomic prostatic capsule: The prostate possesses a fine, closely adhering fibrous capsule of its own, and is fixed in its position by fibrous tissue. The latter has been termed by A. Retzius ligamentum pelvioprostaticum capsulare, and presents itself partly in the form of an envelope and partly as band-like strips (ligamenta puboprostatica) extending outwards in this covering. The visceral fascia, first exactly described by Desnonvillier, is detached laterally and posteriorly from the pelvic fascia and appears as an application of this fascia upon the prostate (Waldeyer). From the prostate it proceeds to the bladder, enclosing the superior surfaces of the plexus pudendalis, the plexus vesicoprostatici, the seminal vesicles, and the ampullæ of the ductus deferentes. Between the rectum and the prostate the capsule is strongest (fascia rectovesicalis).

Excepting the posterior surface, which is covered by Desnonvillier's fascia, the prostate can be only artificially enucleated from its anatomic capsule, but not at all in the manner in which the hypertrophied gland is shelled out by the surgeon. The capsule in the surgical sense is formed by atrophied prostatic tissue, which has been compressed by the hypertrophied portion. The pathologic anatomy will be discussed under hypertrophy.

The relation between the glandular and the musculoconnective tissue portion of the prostate is very variable both in different individuals and at different periods of life. According to Rüdinger, in one case the glandules and their ducts may represent five-sixths of the organ, whereas, in another of the same age, they can be reduced to one-third of the mass.

Islands of *lymphoid tissue* are frequently observed in the prostate. Weski, who has carefully studied these, notes their analogy to those found by Waldeyer in the dog's prostate. He mentions the possibility that the structures may be pathologic, but believes on account of the entire absence of other evidences of inflammation in the same glands, and on account of the known presence of similar lymph follicles in other glands, that they may be considered physiologic.

The *arteries* arise principally from the inferior vesical artery. A few small branches also arise from the middle hæmorrhoidal and internal pudendic arteries. They enter the periphery at numerous points, penetrate the gland and divide, forming a close capillary meshwork within the alveolar walls.

The veins form a rich plexus within the glandular tissue and around the ducts. They emerge from the organ laterally and pass in part into the rich plexus within the capsule, and in part beneath the mucous membrane in the region of the orificium internum and the colliculus seminalis. Bordering on the anterior surface of the prostate, behind the ligamentum arcuatum pubis and under the edge of the symphysis pubis is the plexus pubicus impar, which receives not only the blood from the prostate but also from the deep dorsal veins of the penis, communicates with trunks from the bladder, seminal vesicles and rectum, and is continued as the prostatovesical plexus to the internal iliac veins.

The *lymphatics* form a wide meshed network on the surface of the gland. Within the organ the lymphatics are richest at the base and most sparse at the apex. Compared with the blood vessels their course is surprisingly tortuous. The lymphatic plexuses on each side form two trunks, a superior and a lateral. The superior passes to the obturator lymph nodes of the pelvis and the lateral to the internal iliac lymph nodes (Sappey). The endothelial cells of the lymphatics are characterized by a very finely granular protoplasm.

The *nerves* of the prostate take their origin from the inferior hypogastric plexus of the sympathetic. The organ is richly supplied with nerves and contains chiefly on its periphery ganglion nodes, numerous isolated ganglion cells and a great number of variously constructed end-organs. As a delicate plexus they pass from the seminal vesicles. In this plexus are present fibers from the anterior roots of the third and fourth sacral nerves.

The nerve end-organs on the outer surface of the prostate have been known for a long time. In the mucous membrane of the pars prostatica von Planner has found numerous bulbous nerve endings which are situated in the more superficial layer of the membrane and which are sometimes plainly visible as elevations. The recent elaborate and painstaking studies of Timofeew have shown that the prostate contains a most complicated system of nerve fibers and nerve endings. He describes a wide meshed plexus of medullated fibers within the deeper layers of the capsule. These fibers lose their medullæ and pass as fine fibrillæ throughout the prostate. The fibers from this plexus form partly tuft-like end structures, partly various kinds of encapsulated end-bodies, and partly send numerous fibrillæ between the cells of the epithelium where they branch freely and end.

Besides these sensory nerve endings there are many others which are apparently secretory, since they agree with similar nerve endings in other secreting glands. In the capsule of the gland and also in the parenchyma Timofeew found a great variety of encapsulated nerve structures. Noteworthy among these are those resembling the Pacinian corpuscles. Timofeew describes them as having two nerve fibers each. One of the fibers is thick and enters the terminal bulb as a naked axis cylinder and ends in the opposite pole as a pointed or knob-like structure. The other fiber is thin, loses its medullary sheath and forms a finely divided fibrillary web, and surrounds the axis cylinder of the first fiber as a loose tunic, without coming in contact with it in any place whatever. Timofeew holds as very likely that these nerve fibers arise from dif-

ferent nerve cells. Besides these forms are found end-structures with a single fiber more or less branching, in all stages of transition from the simplest cylindrical form up to multiple branching forms, besides the usual Pacinian corpuscles.

Timofeew has demonstrated on the striated muscle fibers of the prostate both motor and sensory nerve end-structures. Both arise from medullary fibers which become non-medullary before they terminate. The nerves occurring in the smooth muscle fibers are non-medullated. They form between the muscular layer thick plexuses of varicose fibrillæ and send forth from these multiple branching fibrillæ between the individual muscle cells which are thus surrounded.

Relations. It will be seen from the above that the more important anatomic relations of the prostate from a pathologic standpoint are (*a*) the base is in intimate contact with the floor of the bladder; (*b*) the posterior surface is separated from the rectum by only scant, tense, cellular tissue, poor in fat; (*c*) the body of the gland embraces a considerable portion of the urethra (pars prostatica urethræ); (*d*) it communicates with the seminal vesicles and the ejaculatory ducts; (*e*) it likewise communicates through the vas deferens with the epididymis and testicles.

PHYSIOLOGY

Extensive clinical and experimental investigations have been made with regard to the physiology of the prostate. Although the subject still needs elucidation from several points of view, yet we are in a position at the present time to make some definite statements on the functional importance of this gland.

In order to correctly appreciate the physiology of the prostate three points must be considered: first, its function as a secreting gland; second, its muscular apparatus, especially its sphincter formation; third, its extraordinary wealth in nerve fibers, ganglion cells and nerve end-organs.

Secretion: The prostatic secretion is a thin fluid of milky cloudiness, slightly acid or neutral reaction and possesses a highly characteristic odor. It is frequently described in the literature as "clear, glossy, thready," etc. Fürbringer was the first to explain that this view is incorrect. The latter has has also shown that the so-called Böttcher crystals of the spermatic fluid have their origin in the prostate. The material for these spermatic crystals, the nitrogenous Schreiner basis, is present in the gland in dissolved state. For their formation the prostatic secretion is the basic portion, and phosphoric acid, the addition of which is essential for the production of crystallization, is furnished by the other components of the spermatic fluid. Prostatic secretion procured from the living by rectal expression presents no spermatic crystals. Fürbringer added ammonium phosphate to the secretion thus expressed, and in every case perfect Böttcher crystals were formed in a short time. The same investigator succeeded in demonstrating these crystals by evaporation of the secretion expressed from the prostate of 56 dead bodies (90 per cent.). In this case postmortem degeneration of the epithelium very likely afforded the necessary phosphoric acid for the crystallization.

The Schreiner basis can be demonstrated in the stratified amyloids and unites in the formation of the nucleus of the concretions. Besides these stratified bodies, there is seen in the prostatic secretion large colorless, moderately refractive, round granules. These produce the milky cloudiness, and, judged by their solubility and other reactions, consist principally of lecithin. The filtrate of the diluted secretion shows albumin, but no mucin. The spermatic odor is due to the Schreiner basis in dissolved form. When this combines with the phosphoric acid and crystallization occurs, the odor departs.

Fürbringer demonstrated that the prostatic secretion causes the spermatozoa, which are normally motionless when stored in the seminal tract, to become motile. However, Posner states that in the fluid of spermatoceles motile zoösperms are frequently found, occasionally also in fluid removed in diagnostic puncture of the testicle. Exner has removed actively motile spermatozoa from the epididymus and the vas deferens of rabbits. Serralach and Parès made similar observations on other animals.

Fresh prostatic fluid added in excess to motionless spermatozoa works sluggishly, while great excess nullifies the movements. Fürbringer attributes this effect to acidity, since the gradual addition of alkalis revives the spermatozoa. The same investigator, while admitting the possibility of the thin prostatic secretion acting also in a physical manner, firmly adheres to its specific physiologic effect, and finds support for his view in the experimental results of Steinach. The latter observed that in a mixture of prostatic secretion and physiologic salt solution the spermatozoa of the rat retain their motility much longer than in physiologic solution alone. Percy has shown that spermatozoa soon die in contact with the uterine mucosa without the admixture of prostatic secretion, while in the presence of the same they remain alive three to eight days. Frisch states that a further support of Fürbringer's view are other facts brought out by Steinach, who has demonstrated that simultaneous extirpation of the seminal vesicles and the prostate,

while not interfering with the power of coition, nullifies the capacity for begetting.

Neusser notes that the persistence of the prostatic secretion in the eunuch—in many cases for a long time after castration—and also his actual power of coition, which persists for years, indicate that an independent function must be attributed to the prostatic gland or to its innervating apparatus.

Launois states that the prostate does not become a genuine secreting gland until the time of puberty, at the same period in which formation of the spermatozoa begins in the testicles. The genital activity of the gland reaches its highest point between the twenty-fifth and the thirtieth year. From the fortieth to the fiftieth year the fibromuscular stratum becomes relatively increased, which is a sign of beginning age.

Many investigations have been made with regard to the fate of the prostatic glands after castration. Casper's work with dogs of the same litter showed that double-sided castration resulted constantly in a marked diminution of the prostate, and the changes were found most pronounced in the glandular portion. These glandular elements did not present the appearance of having been compressed by proliferation of the connective tissue, but showed simple diminution of the individual cells, even to complete loss of the cell protoplasm.

Launois found that after castration of young animals the prostate remained at the same stage of development in which it was at the time of castration; but in completely developed individuals the organ became atrophied, at first the glandular tissue and then the musculature.

Englisch, in 1282 observations, established the relation between prostate and testicles at different periods of life, and states that the former does not reach its complete development until after the twentieth year.

That the prostate possesses an internal secretion, which acts upon the external secretion of the testicles, vas deferens and seminal vesicles, is strongly suggested by the work of Serralach and Parés. They found that after removal of the prostate from dogs the secretion of all the sexual glands ceased. Whenever, following prostatectomy, a glycerine extract of the prostate had been injected, atrophy of the testicles did not occur, emissions took place and spermatozoa were demonstrable in the ejection.

In the light of the anatomico-physiologic, experimental, and pathologic investigations, the prostate, viewed as a secreting gland, is to be considered an essential part of the genital system.

Muscular Apparatus: Various observers agree that the arrangement of the smooth muscle fibers, longitudinally about the tubes, and circularly about the alveoli, is such that by their contractions the accumulated secretion is at once, or in a short time, expelled into the urethra.

Lusena states that the quantitative relation of the muscle to the glands of the prostate varies according to the age of the individual. The smooth muscle fibers are developed earlier than the glands. In the embryos of rabbits 7 cm. long no glands whatever are to be seen, whereas the muscles are already well developed. The same is true also of man. In the adult muscles and glands are present in about equal amount; in old age the muscles outweigh the glands.

The more recent examinations by anatomists and the experiments by physiologists have proven that the mechanism of the bladder-closure and urinary discharge is to be attributed to the sphincter muscles of the prostate. Socin states that the entire involuntary sphincter internus and a greater part of the voluntary sphincter externus are to be looked upon as essential portions of this organ. This view is in contradistinction to that of Rehfisch, also accepted by Posner, who maintains that the prostate has nothing to do with bladder-closure, since it represents a specific glandular organ. Finger calls attention to the fact that the prostatic musculature also furnishes a closing apparatus for the seminal vesicles and the ductus ejaculatorii.

It can no longer be doubted that the closure of the bladder is primarily accomplished by the smooth sphincter internus, which is in a condition of constant tonus. For the act of urination this tonus must first relax, and then only can the detrusor work effectively.

It is a much mooted question whether, in the production of bladder-closure and urinary discharge, the smooth fibers can be stimulated voluntarily or only in a reflex manner. It has been frequently stated that the peculiar arrangement in the prostate of the smooth musculature in association with numerous striated muscles is a physiologic question of great importance, and that here voluntary and reflex contractions may work together in a manner similar to that on the anus and the transitional area between the pharynx and the esophagus.

A few writers maintain that in case of moderately filled bladder and no urgency to urinate, the introduction of urinary discharge requires the voluntary contractions of the abdominal or certain perineal muscles (bulbo- and ischiocavernosus), or the compressor urethræ (Landois, Dubois). Others have held that the fibers of the detrusor could actively effect the sphincter internus, a condition which appears unlikely when the insertion of the detrusor fibers is considered (E. Zuckerkandl). Rehfisch states that the internal sphincter is capable of voluntary contraction, and endeavors to support this view by the following experiment: A man's bladder was filled with 300 to 400 cc. of boric acid solution, and then a catheter introduced so that its opening lay in the pars prostatica. The man could discharge or retain his urine at request. By this procedure the sphincter externus, the compressor urethræ, the entire perineal musculature and the ischio- and bulbocavernosus were excluded from activity in the closure of the urethra. The experiment was successful twenty times, and apparently could only be explained by the possibility of volun-

tary contractions of the smooth sphincter internus. Frisch, however, gives a different explanation: "There is nothing contradictory to the supposition that this apparent voluntary contraction of the sphincter internus was caused by the contractions of striated muscles, even though the latter by themselves could not have produced the bladder-closure. If in this same experiment the perineal musculature be controlled by placing a finger upon the perineum, there is felt simultaneously with the interruption of the urinary discharge an evident bulging in the region of the bulbus, caused by a very energetic contraction of all the auxilliary muscles of the compressor." This observation has a very important bearing on the postoperative prognosis. Frisch further observes that, according to Rehfisch's opinion, as soon as we experience the sensation of urinary pressure, a stimulus is sent from the brain to the center for bladder-closure situated in the lumbar region of the spinal cord, and, thereby, the sphincter contraction, which is reflexly produced by this center, is inhibited, the sphincter becomes relaxed and urination takes place.

Another point which has been debated as freely as the physiologic process of urinary discharge, is the question of the so-called bladder neck, that is, whether in case of a tensely filled bladder the urethra prostatica experiences a widening, through relaxation of its muscular and elastic fibers, and by this the posterior portion of the urethra becomes a part of the urinary reservoir. The weight of opinion based upon experimental evidence is in favor of this view. Finger has shown that the distance from the orificium externum of the urethra to the bladder, when the latter is tensely distended, is two to three cm. less than when it is moderately filled. Rehfisch has convincingly proven that neither the force of abdominal pressure nor contraction of the detrusor are capable of mechanically overcoming the closed sphincter internus. "Nevertheless," Frisch says, "it seems to me that the possibility of this formation of the bladder neck, against which the slightest doubt does not exist on my part, is to be easily explained, if it be assumed that the passive distention of the pars prostatica is preceded by a relaxation of the sphincter-tonus. How long the striated musculature of the sphincter externus and compressor urethræ can withstand the pressure of the urine varies greatly in individuals, but that the striated muscles tire more easily than the smooth cannot be brought forward as a proof against their ability to produce closure."

Many reliable investigators have attributed the sensation of urinary pressure to the pars prostatica, and explain its origin by the irritation of the first drops of urine. This theory has not been generally accepted. Most of the recent investigators hold that the condition is due to stretching of the bladder, which causes a contractile sensation produced by the contracting muscles.

Frisch observes that in spite of all the arguments that are advanced for the "contraction theory," it does not explain the strangury which is so frequently noted where the bladder is empty and diseases of the prostate are present. The sensation of contraction seems able to effect consciousness only when the bladder contains fluid, and, consequently, the contracting walls meet with a resistance (v. Frankl-Zuckerkandl). Born was experimentally demonstrated that contractions of the empty bladder do not produce strangury. Therefore, we must be able to explain this sensation in another way. Frequently repeated, severe strangury has been noted in the presence of irritative conditions of the pars prostatica, without a drop of fluid in the bladder. All inflammatory processes in the posterior urethra, sounds, catheters, palpation per rectum with pressure in the median furrow, application of silver nitrate, suppositories, and similar treatment, and stone or tumor in the neck of the bladder have been cited as causal factors. In cases of stones in the bladder, strangury has been noted while the patients stood upright, but complete relief followed the assuming of the horizontal position. Here the condition could only be explained through irritation of the bladder neck.

Therefore, the pars prostatica is also to be considered a portion of the urinary apparatus which can cause this sensation, a fact that is generally admitted, even by the supporters of the "contraction theory" (v. Frankl-Zuckerkandl).

In favor of the latter theory are the investigations of the writers just mentioned, who have shown by examinations of patients with spinal diseases, that the sensation of urinary pressure may be normal in the absence of sensitiveness on the part of the mucous membrane, and, on the other hand, it may fail when the mucous membrane is sensitive.

Abnormal irritation of the pars prostatica raises the sphincter tonus high above the normal, for example, hyperæmia, hyperæsthesia, and catarrhal irritation in the region of the colliculus seminalis, the causes of which, besides gonorrhæa, are onania, coitus interruptus, and various other venereal excesses. This increased tonus occurs physiologically when in the case of a distended bladder the urine is retained abnormally long. In such an event the individual remains quiet and relaxes his muscles in endeavoring to urinate, in contradistinction to the modus operandi of a patient suffering from a stricture or an enlarged prostate. This indicates the role played by relaxation of the sphincter tonus in emptying the bladder.

Peculiar instances of voluntary mental distraction, the effect through the sense of hearing, e. g., running water, and other artificial means are cited as contributing to the release of the increased muscular tone in the sphincter. Whereas these and other methods are always to be reckoned as assistants in producing this effect, still of their very nature they are not capable of exciting active muscular contractions.

From the foregoing it is concluded that the musculature of the prostate expresses the

prostatic secretion into the urethra. The sphincter internus and the sphincter externus are essential parts of the prostate and concerned in bladder closure, the former by its constant tonus, the latter when, in the case of a distended bladder, the so-called "bladder-neck" is formed. That the voluntary perineal muscles can act in an accessory manner in producing bladder-closure and urinary discharge seems to have been experimentally demonstrated, which is an important point in postoperative prognosis. Whereas the "contraction theory" has weight in the case of a tensely filled bladder, still it does not explain the sensation of urinary pressure, or strangury, which is frequently experienced when the bladder is empty. Investigations prove that the pars prostatica urethræ must be considered an important factor in the production of this sensation.

Nerve Supply. All the motor and vasomotor fibers in the nervi erigentes and the nervi hypogastrici, which arise from the inferior mesenteric ganglion, reach the prostate. Stimulation of the erigentes has a negative result or, in the beginning, there occurs a discharge of a considerable amount of the secretion, which is then followed by a complete cessation; on the contrary, stimulation of the hypogastrici produces a continuous, genuine secretion. Mislawsky and Bormann observed in experiments on curarized dogs that when a canula was introduced into the urethra and connected with a long perpendicular tube, the level of the fluid mounted rapidly upwards through stimulation of the nervi erigentes, and sank again downwards as soon as stimulation was suspended. Under similar conditions, when the hypogastrici were irritated the entire tube became filled and the fluid flowed out from above. The erigentes, therefore, only force from the gland the fluid that is secreted by irritation of the hypogastrici, which are, therefore, the genuine secretory nerves. Irritation of the stump of the nervus hypogastricus when the same-named nerve of the other side is intact also produces secretion, even when the inferior mesenteric ganglion is separated from the rest of the sympathetic cord, consequently, from the spinal cord itself.

According to M. v. Zeissel's investigations the nervi hypogastrici contain motor fibers for the sphincter and inhibiting fibers for the detrusor; the nervi erigentes, on the contrary, contain motor fibers for the detrusor and inhibiting fibers for the sphincter. The law of "crossed inervation" is to be considered in both these nerves.

An experiment by the same author shows that the numerous ganglia in the prostate and bladder are important for bladder-closure and urinary discharge, and that these must be looked upon as centers. All the nerves leading to the bladder of a dog were divided, but, in spite of that, the animal was able to retain his urine and empty his bladder in a perfectly normal manner.

It has been repeatedly shown that the origin of manifold local and general neuroses, which are associated with chronic inflammation of the posterior urethra, must be due to the extraordinary nerve supply of the prostate, particularly the numerous end-organs, ganglion cells, and ganglion nodes. The two latter should probably be considered peripheral centers. Considering the effects of mechanical, chemical, and inflammatory irritations of the posterior urethra, Finger supposes that the mucous membrane of the pars prostatica must contain specific senory nerve-endings, and, therefore, that this part of the urethra is to be considered capable of producing the sensation of urinary pressure.

Palpation of the prostate per rectum stimulates erection, especially in children. The passage of large sounds into the posterior urethra acts likewise. Various acute inflammatory conditions in the prostate, particularly in the colliculus seminalis, produce symptoms of priapism, frequent erections, pollutions, ejaculatio præcox, and, at times, increased sexual desire. On the contrary, older inflammatory processes with the formation of cicatrices, degeneration, and atrophy can be accompanied by impotence, retarded or incomplete emissions, and diminished or total loss of sexual sensations.

Kobelt attributes to the colliculus seminalis the greater part of the sexual function, and also maintains that regurgitation of the semen towards the bladder is prevented by the temporary swelling of this structure. The latter point does not seem to have been sufficiently proven. Frisch states it is very likely that regurgitation is also prevented by the sphincter internus. This view is supported by an observation by Anderson, who noted regular regurgitation of the spermatic fluid in a patient suffering from prostatitis. Here the effect was due to relaxation of the sphincter, which was caused by the inflammatory process. Cooper states that this form of aspermia occurs frequently in association with prostatitis, and Frisch cites the same condition in a case of prostatism with incontinence of urine.

This brief review of the function of the prostatic nerve-supply indicates that the nervi hypogastrici are the secretory nerves, and that the nervi erigentes cause the mechanical expulsion of the secretion. Both of these nerves possess motor and sensory fibers, which act in such a manner upon the sphincter and the detrusor muscles, that the law of "crossed innervation" is to be considered. The numerous ganglia in the prostate and bladder are to be looked upon as independent nerve

centers in the production of bladder-closure and urinary discharge. The nerve supply, especially in the region of the colliculus seminalis, contributes to the sensual phase of the genital function.

PATHOLOGY

1. Acute prostatitis. *a.* Catarrhal. *b.* Follicular. *c.* Parenchymatous. (Segond's classification; also held by Guyon).

2. Chronic prostatitis.

Etiology. As idiopathic primary processes they are rare, and, excepting as complications of gonorrhœa, infrequent.

Causes attributed by various authors are: From without — injuries due to horseback riding, bicycle riding, and similar exercises; from within — unsuitable introduction of instruments, too frequent and unclean catheterization, lithotripsy, abortive injections, too severe cauterization of the pars prostatica (especially with the pencil — Guyon), unnecessary duration of the self-retaining catheter, caught stones and foreign bodies, stricture of the urethra.

Disposing causes. Congestions and irritations in the rectum (hæmorrhoids, foreign bodies, fissures, fistulæ, proctitis and periproctitis), chronic obstipation, dysentery and enteritis, venereal excess, masturbation, coitus reservatus, metastases in pyæmia, typhus, measles, smallpox, croupous pneumonia, parotiditis, influenza, tonsillitis, carbuncle, furuncle, phlegmonous angina, gout, syphilis, cystitis, stones in the bladder, prostatic hypertrophy, and infection by way of the blood.

By far the most frequent cause is gonorrhœa. Prostatitis can follow not only every acute gonorrhœa of the posterior urethra, but also every stage of chronic gonorrhœa. The older the latter the more frequently will the prostate be found diseased. Whereas the infection is usually from the posterior urethra, many admit its possibility from the anterior urethra — perhaps by way of the lymph channels.

Opinions as to the frequency with which prostatitis follows gonorrhœa vary within wide limits.

These differences are explained as probably due to errors and difficulty in diagnosis: those holding high percentages including in their statistics the mild, but more frequent cases; and those quoting low percentages limiting their diagnosis to only severe parenchymatous prostatitis. The weight of evidence, however, appears to favor the opinion that prostatitis is a frequent complication of gonorrhœa.

In our series of 468 cases, seven were tuberculous. Tuberculosis of the prostate is principally a disease of the young adult, though our meager list of cases does not show it.

With regard to its etiology it is highly improbable that heredity is a predisposing cause though it has been suggested by a number of observers. It is also unlikely that acute local hyperæmia, or acute inflammations, as in sexual excesses, acute cystitis, etc., predispose to tuberculosis. Chronic inflammations, on the other hand, may do so. There is no basis for the supposition that direct infection may come from without. Infection takes place most frequently through the blood stream. The well-known tendency of the prostate to exhibit evidences of infection in typhoid fever, glanders, etc., is analogous to the condition which probably obtains in tuberculosis, namely, that the organ is one in which even small amounts of bacilli circulating in the blood are caught and stored up. That the prostate may be the only organ of the body secondarily affected by tuberculosis is shown by the number of cases reported as permanently cured after prostatectomy.

Secondary disease of the prostate may be developed from the epididymis or, more rarely, from the kidney or the seminal vesicles. Baumgarten and Krämer have shown that the extension of tuberculosis in the urogenital tract follows the stream of the secretions and rarely proceeds against the stream. It must be noted, however, that several portions of the urogenital system may be effected simultaneously and independently of each other through the blood stream.

The tuberculous prostate is frequently more involved in one lateral lobe than in the other. The periphery of the lateral lobes is the most frequent site of tuberculosis. In all of our cases the disease was confined to the lateral lobes and not in the neighborhood of the urethra.

Microscopically, the tubercle bacilli are usually demonstrable between the epithelial cells and in the borders of recent tubercles. Secondary infections are occasionally present, producing suppurative softening and abscess instead of ordinary caseation. Staphylococci, and, more frequently, b. coli communis are usually the accessory pathogenic organisms. Hallè and Motz hold that surgical interference should not be attempted in cases with acute secondary infection.

In case of infection from the intestine the micro-organisms pass directly from the intestine through the inflamed wall into the prostate. Infection by way of the blood is to be assumed when a direct transmission from the urethra, from the intestine, and by way of the lymph channels can be excluded. This holds for primary suppurative prostatitis as well as for the chronic form.

Thompson, Guyon, and others hold that a sound prostate cannot be injured by horseback riding and other similar exercises. Instances have been noted where latent gonorrhœa had been lighted up by riding, but soon subsided after cessation of exercise.

Albarran states that 100 cases of prostatic hypertrophy, examined microscopically, showed indubitable signs of chronic inflammation in all. The greater part of the bladder troubles of old people are due more to exacerbations of chronic prostatitis than to hypertrophy. In about half of our cases there was more or less infiltration or circumscribed accumulation of round cells.

According to Weigert, the prostate is an emporium for the infectious material; foci are very frequently present in cases of pyæmia and septicæmia.

Hannau demonstrated in a case of pyæmia the transition of the micro-organisms from the blood and their passing through the epithelium into the glands of the prostate, where abscesses resulted.

Acute prostatitis. The ordinary picture of text-books is misleading. These describe the symptoms of the severe parenchymatous type, making that the typical picture of acute prostatitis, whereas both the lighter forms, namely, the catarrhal and the follicular, are much more frequent.

(*a*) Catarrhal prostatitis. Acute gonorrhœal catarrah of the prostatic gland is undoubtedly the most frequent form of acute prostatitis, and it is very likely that acute posterior urethritis cannot run its course without involving the gland. The gonococci pass quickly into the excretory ducts and produce a deep-seated process, involving prostatic glandules, utriculus, ejaculatory ducts, and even the seminal vesicles.

(*b*) Follicular prostatitis. This is developed as a rule from acute gonorrhœal catarrh. It occurs frequently as a sequence of posterior urethritis, but can even be associated with chronic prostatitis. There is stagnation of the secretion, due to obstruction of the openings, and the process leads to the formation of abscesses. Jadassohn designates these as "pseudo-abscesses," since the suppuration exists in pre-formed cavities. The cut surface in the lateral lobe presents points of thick pus.

(*c*) Parenchymatous prostatitis. This involves the entire gland. The lighter forms are designated as hyperæmia or congestion of the prostate. The organ is doubly, even quadruply enlarged, feels hard and tense. The blood-vessels on the surface are redundantly filled with blood. The cut surface of the prostate is more markedly reddened than in the healthy organ. On pressure there is expressed a reddish and somewhat cloudy fluid — a mixture of lymph and serum — arising from blood in the distended capillaries, also from prostatic fluid and a small amount of pus, since there is to be seen merely a few pus cells under the microscope.

Chronic Prostatitis. Etiology. Guyon and Fürbringer consider chronic prostatitis a rare condition, whereas Finger, Frisch, Posner, and several others hold that it is common.

Gonorrhœa is the most frequent cause. Other causes mentioned are onania and other sexual excesses, stricture, cystitis — chiefly where ammoniacal urine is present — vesical and prostatic stones, catheterization and other traumata, and hypertrophy. Stern speaks of prostatic affections in diabetics and bases his opinion upon the fact that when such patients are placed upon a diabetic diet

the symptoms subside, to recur when this diet is disregarded.

Pathologic anatomy. Gross examination often presents no striking changes in consistence, size, and appearance of the organ. Sometimes it is nodular and irregular, enlarged or smaller than normal. When its size is small the tissues have been consumed by suppurative processes. The cut surface most frequently presents on various places manifold deviations from the normal, but at times appears generally succulent and reddish. In some places the tissue is softened, brownish or pale yellowish, in others whiteness, dryness, and firmness manifest themselves, The entire prostate may be transformed into a cicatricial tissue, in which yellowish and brownish-black pigmented specks are to be seen. In still other places the glandular groups form prominences on the cut surface visible to the naked eye. These prominences are swollen with juice or transformed into small pus foci, which may become confluent, producing larger sized little abscesses. Isolated pus foci are also found in the fibromuscular stroma. Frequently the pre-existing cavities become enlarged and transformed into cyst-like structures, appearing as gaping openings in the stroma of the hardened connective tissue. These cystic cavities can be isolated in one lateral lobe, or are multiple, in which case the entire gland is then transformed into a conglomeration of from pea to nut sized cavities, filled with urinopurulent or mucous, foul fluid, frequently mixed with blood. The connective tissue walls are often very thin, and even the entire prostate can be changed into a single cavity.

In the case of gonorrhœal prostatitis the striking changes take place almost always at the caput gallinaginis. This is either symmetrically or asymmetrically enlarged, its mucous membrane loosened, and possesses here and there papillary excrescences, or is thickened like a cicatrix.

A point worthy of note is the fact that a genuine new formation of glandular tubules is to be observed on the glands in many cases, a point, which, up to the present time, has been only superficially mentioned by Albarran. This glandular new formation is at times of such a kind that an adenomatous-like structure arises. However, there is always seen in the immediate vicinity inflammatory foci, often in very luxuriant growth, and in direct communication with the real inflammatory center, so that there is no doubt of the causal relationship between the inflammation and the glandular development.

Hypertrophy: *Statistical data.* In our series of 468 prostatectomies, 387 cases (83 per cent) were hypertrophy, the remainder being cases of tuberculosis or neoplasms. The ages of the patients whose prostates showed hypertrophy only were as follows by decades:

50 to 60 years of age.....	65 (17 per cent.)
60 to 70 years of age.....	194 (50 per cent.)
70 to 80 years of age.....	116 (30 per cent.)
80 to 90 years of age.....	12 (3 per cent.)

It will be seen from the above table that all of the cases were above 50 years of age, and that 83 per cent were above 60 years of age. Thus all of the patients may fairly be assumed to have passed the most active period of sexual life. Of these patients, 78 per cent were married, 18 per cent were widowers, and 4 per cent were single.

Of our 387 cases in only 70 was the parenchyma increased without apparent increase of the stroma. In but 17 the stroma was increased without any apparent increase of the parenchyma, while in 300 cases there was increase of both stroma and parenchyma. In 205 of the cases the increase in the muscular element was sufficiently prominent to be noted. While, of course, these observations do not cover microscopically every portion of the gland removed, they have been made on sections selected in each case from a number of different areas.

In 266 cases there was present a round celled infiltration either diffuse or somewhat circumscribed. In these cases it was usually impossible to say whether or not the round celled infiltration was lymphoid or inflammatory tissue.

Pathologic Anatomy. Hypertrophy of the prostate, so-called, represents an enlargement and change of form caused by an increase in the volume of its individual tissue elements, that is, of the normal morphologic factors of

the organ, and not of a production of heterogenous elements. Of these the fibromuscular stroma is almost always increased in volume. If it is increased in proportion to the parenchyma the gland is increased in density. This has been sometimes designated scirrhus, but has nothing in common with true scirrhus, since the tissue is not scar tissue. It is not to any great extent muscular, but is most markedly an increase of the fibrous tissue element. When a fresh hypertrophied prostate is sectioned grossly the parenchyma, if increased to any considerable extent, bulges above the cut portions of the stroma, presenting, usually, a number of prominent whitish nodules between which are yellowish or yellowish-red more succulent areas, which on slight pressure exude a cloudy yellowish juice. This in turn may contain a greater or less amount of yellowish brown or black granules, the corpora amylacea.

The literature presents various classifications of prostatic hypertrophy. More recent investigators have proven that this deversity of description is due to the absence of a uniform conception as to the starting-point and progress of the pathologic changes. A work which has substantially advanced our knowledge of this subject is that contributed by Tandler and Zuckerkandl. Availing themselves of the great amount of suitable material at their disposal, these two authors investigated the subject of prostatic hypertrophy by means of especially adapted, skillful sections of cadavera and the study of specimens removed intra vitam. Sections were made of pelves presenting prostatic hypertrophy and pelves of cases on which prostatectomy had been performed and the patients died, some within a few days after operation, one following an interval of two years. By this method of investigation these authors were enabled to exactly study the characteristics of hypertrophy in the prostate, and note not only what takes place in the operation of prostatectomy but also how the anatomic regeneration proceeds. Their discussions are supported by the dissection of 42 cases. They state that their examinations revealed in the first place the remarkable fact that an hypertrophy of all parts of the prostate does not exist. In their cases of most pronounced hypertrophy they always found parts of the prostate atrophied. Therefore, hypertrophia prostatæ totalis, in the usual sense, is a misnomer. In that series of cases hypertrophy of the posterior lobe was not once observed, and in none was the middle lobe free from the hypertrophic changes.

The authors claim to have established that the extension of prostatic hypertrophy in the sagittal plane takes place exclusively in that part of the organ which extends longitudinally from the orificium internum urethræ to the opening of the ductus deferentes, and, furthermore, that the hypertrophic process effects primarily only those parts which are in contact with that portion of the urethra which is involved in the vesical neck and situated above the colliculus seminalis. This is the middle lobe as described in the normal anatomy. The part of the prostate situated behind the ductus deferentes, which comes in contact with the urethra only distally from the colliculus, is always greatly reduced in thickness, never hypertrophied, but in the condition of pressure atrophy. Consequently, the entire posterior half-ring is not involved in the hypertrophic process. The peripheral layers of the so-called lateral lobes were not found to be the starting-point of the hypertrophy in any case.

Why the middle lobe of the prostate so frequently undergoes these changes, and the other parts remain free cannot be stated, but it is emphasized that here the degeneration effects portions of the glandular prostatica, which are also embryologically definable from the remaining parts of the gland.

Although the place of origin and the zone of hypertrophic extension are relatively uniform, nevertheless the number of individual variations in shape is almost inexhaustible, since these are dependent upon the size of the individual parts, their direction of growth, the localization of the first starting-point, also from the variable extension of the glandular zone of the middle lobe.

Figure 1 is an illustration from Tandler and Zuckerkandl's work and represents what the authors designate a typical case. On sagittal section there is seen, in place of the prostate,

a greatly developed tumor-mass, which apparently embraces the entire gland. But the relation of this mass to the ductus deferentes shows at once that the hypertrophy is situated only in that part of the prostatic ring which is bladderwards from the ducts, whereas the portion directed towards the perineum is not hypertrophied, but instead appears compressed to a thin plate.

The mass is developed towards the bladder and has, with elongation of the enclosed urethra, elevated the vesical floor in toto and also produced a bulging forwards of the trigonum. Viewed from above (Fig. 2) this prominence gives the impression of a large plug embracing the ostium urethræ posteriorly. In other cases the bulging part effects the lateral, sometimes even the anterior boundary of the orificium, without the deeper portion presenting a fundamental deviation from the given example. Therefore, these differently shaped projections of the prostate are only variations of one and the same condition.

It also happens that the entire vesical floor is elevated without a pronounced tumor-mass of the opening. Cystoscopic and postmortem observations might cause the supposition that with this diversity of appearance at the vesical opening, in one case a projecting mass, in another no particular prominence, two completely different forms of hypertrophy are to be considered, notwithstanding the fact that in these cases, apparently so dissimilar, the same starting-point and the same localization of the hypertrophy in the middle lobe are present.

The relations of the hypertrophied prostatic part to the bladder and its other surroundings is shown in Figure 3. Here the enucleated prostate is seen reset in its bed. To be especially noted is the pear-shape of the entire mass and its extension downwards and outwards.

The prostatic urethra is changed in direction, form, and dimensions (Fig. 1). Under physiologic conditions it has a feebly arched course, but here it is bent almost to a right angle. The apex of the angle corresponds to the colliculus seminalis; its upper leg, which extends from the vesical outlet to the colliculus, is situated in the hypertrophied portion of the prostate, while the lower one, which courses from the colliculus onward, is in relation with the posterior lobe, and, accordingly, not deformed by the hypertrophy. Consequently, in the longitudinal direction the process affects exclusively that portion of the urethra which is proximal to the colliculus. The urethra appears elongated continuously with the advancing hypertrophy, a condition which is intelligible from the close relation of the latter with the proximal part of the urethra.

To this absolute elongation of the urethra there is added an apparent lengthening, due to the fact that the lowest part of the bladder is narrowed to a canal by the upward growing mass, and consequently a new, more highly situated orificium is simulated.

Since the hypertrophic zone not only develops in the vertical, but also in the sagittal diameter, the urethra becomes widened in the latter diameter, but, naturally, only in the limited portion of the canal above described. The effected urethra becomes a deep sagittal cleft, which divides the entire hypertrophic mass into halves. Asymmetrical development of both sides causes deviations, that is, irregular expansions of the urethral lumen.

Through the growth of the lobus medius there results in the first place a forward pressing of those parts of the vesical sphincter, which are situated on the posterior border of the orificium urethræ. Therefore, viewed from above (Fig. 2) in many cases the anterior border of the urethra appears sharp-edged and, on the sagittal section, presenting the muscular mass plainly raised, while the posterior portion, which is embraced in the hypertrophic process, shows no evidences of sphincter structure. However, the form of the isolated prostate, likewise the lateral wall after enucleation, indicate clearly the position of the sphincter formation, which manifests itself on the former by a furrow (Fig. 3), on the latter by a prominence (Fig. 4).

Changes are also to be demonstrated on the intra prostatic portion of the ductus deferentes. The hypertrophic mass, which is developed between the canalis urethralis and the canalis deferentialis prostatæ presses both embedded structures out of their positions,

whereby the angle between the two canals becomes larger. The ductus deferentes no longer course steeply downwards, as in the normal, but more horizontally. This is accompanied by alterations also in the positions of the seminal vesicles and the ampulla of the ductus deferentes.

Besides other known severe changes in the bladder, the trigonum vesicæ is either elevated in toto or only in part pressed towards the vesical cavity; the torus intrauretericus often projects forwards in the form of a large tumor, whereby the recessus retrouretericus is transformed into a deep groove. The openings of the ureters have never been found widened.

The specimens of prostatic hypertrophy removed by Tandler and Zuckerkandl from the cadaver similated completely in their form those obtained from the living, when the hypertrophy had developed in one piece. By the study of prostates removed at operation, it has been demonstrated that grossly they are identical, presenting only individual variations in form. The hypertrophy presents in general two parts, one pointing towards the bladder, the other towards the pelvic floor. On the posterior surface these are usually distinguished from each other by a wide, well-marked groove. This depression corresponds to the sphincter of the bladder, and accordingly marks the anatomic position of the vesical opening. The form of the enucleated prostate depends upon the relative sizes of the vesical and the pelvic portion. Usually the base of the mass is the more developed part, and the entire structure is comparable in its form to a pear, somewhat flattened anteroposteriorly (Figs. 3 and 6).

The vesical portion contains the opening of the bladder. This is either partially or completely embraced by the hypertrophied prostatic tissue, or the latter does not project beyond it, in which case the opening appears as a depression. Most frequently this opening is covered from the sacral side by a ball-like projecting plug, which produces a considerable stretching of the margin of the orificium, where this has remained unchanged (Fig. 6). In another group of cases the hypertrophic tissue projects also laterally about the opening in the form of a horseshoe. Frequently the hypertrophied prostate does not completely enclose the urethra, but is open anteriorly (Fig. 8).

The pelvic portion of the prostate present more pronounced expansion in the form of large nodules on both sides. These can either be identical in form and size, or through varying development there result manifold shapes. A comparison between the normal prostate and the hypertrophied specimen, as described above, shows that the former has its broad surface directed towards the bladder and its apex towards the pelvic floor, while the latter presents the opposite relations (Fig. 4).

In the normal prostate the urethra ends anteriorly on the inferior pole, but in the extirpated prostate the end of the urethra is found on the posterior surface of lower pole and the canal extends beyond the normal organ in the longitudinal direction (Fig. 9). Furthermore, the specimens present no sign of the opening of the ductus deferentes, nor can the boundaries of the middle lobe be discerned either on the surface or on sagittal section. Therefore, it is evident that the enucleated hypertrophic mass corresponds to the middle lobe and the centrally located portions of the prostate, which are connected with this lobe and embracing the urethra on both sides. Figure 12 illustrates the cavity remaining after prostatectomy performed intravitom. This cavity is almost always divided into two superimposed parts, which are separated from each other by a circular blunt prominence. The latter corresponds to the massed musculature of the sphincter. Since this elevation separates the intravesical portion of the hypertrophied prostate from the subvesical portion, its position varies with the size and relation of these parts.

The remaining walls of the cavity show differences in structure. If a portion of the bladder wall is present in the upper part of the capsule it consists of the mucosa and the underlying thick muscularis of the trigonum. If submucous glands exist on this place, glandulæ supraprostaticæ, these are demonstrable as a genuine layer beneath the mucous membrane (Fig. 4).

On the posterior wall of the capsule are, in

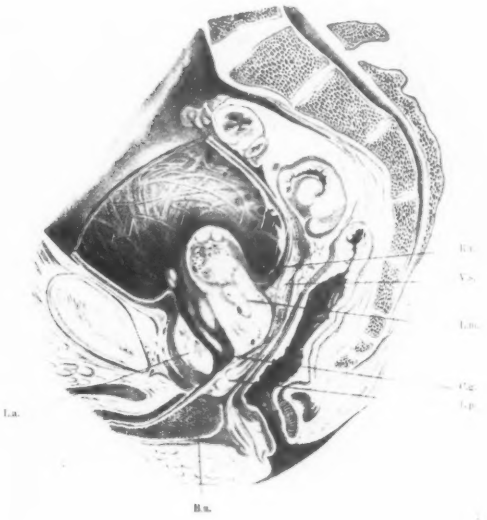


Fig. 1. Sagittal section through the pelvis, showing the prostate hypertrophied. *B. u.*, Bulbus urethralis. *C. g.*, Caput gallinaginis. *L. a.*, Lobus anterior. *L. m.*, Lobus medius. *R. r.*, Recessus retrouretericus. *V. s.*, Vesicula seminalis. A short probe projects from the ejaculatory duct. (Tandler and Zuckerkandl. Verlag von Dr. Werner Klinkhardt, Leipzig.)

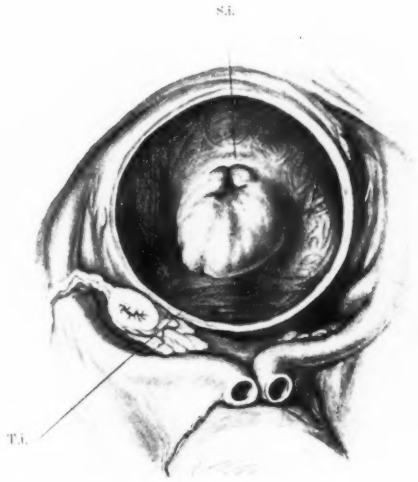


Fig. 2. The hypertrophied prostate viewed from above. *S. i.*, Prominence of the sphincter urethræ internus. *T. i.*, Torus interuretericus. The tumor is seen projecting towards the bladder. On both sides of the urethral opening are small hypertrophies arising from the submucous gland. (Tandler and Zuckerkandl. Verlag von Dr. Werner Klinkhardt, Leipzig.)

the first place, the musculature of the bladder and, below this, thickened smooth muscle fibers, into which the former passes without defined limits. On the inferior wall is the intact ductus deferens, which can be traced to the caput gallinaginis. Beneath the ductus lies the flattened lobus posterior prostatæ.

The anterior wall of the cavity presents the musculature of the bladder passing downwards directly into the sphincter fibers. At the bottom of the cavity (Fig. 4) is seen the stump of the distal urethra, in whose posterior wall the elevation of the colliculus seminalis and the openings of the ductus deferentes are visible. The facial layers of the normal prostate are not to be seen on any part of the wall. Consequently, in hypertrophy, the so-called prostatic capsule consists of prostatic tissue and has nothing to do with those connective tissue coverings which are designated by the anatomists as capsule.

Examination of the wound proves that not a single connective tissue space of the pelvis was opened by the prostatectomy, but that the removal of the hypertrophic mass was performed intraprostatically. Histologic examination confirms this view of the capsule's composition.

The thickness of the prostatic capsule depends upon the degree of compression, consequently upon the size of the hypertrophied portion of the gland. If, after a typical prostatectomy, the enucleated mass be returned to its position in the subject and the structure be viewed externally, the form corresponds considerably to that of the normal. The notable difference is the relation between the vesicula seminalis and the posterior contour of the prostate. Whereas normally the seminal vesicle disappears in the angle between the floor of the bladder and posterior surface of the gland, in these cases of hypertrophy the groove formed at the juncture of those two organs is high above the entrance of the vesiculæ seminales, or ductus deferentes. This distance (Fig. 10), which sometimes amounts

Fig. 3. The enucleated left half of the prostate was applied to the sectioned right half in order to demonstrate the relation of the separated gland to its surroundings. (Tandler and Zuckerkandl.)

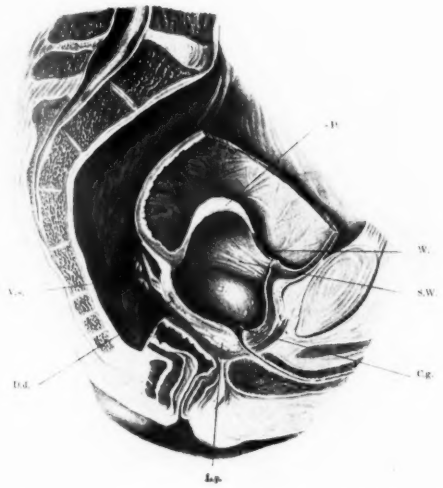


Fig. 4. Left half; the prostate was enucleated postmortem. *C. g.*, Caput gallinaginis. *D. d.*, Ductus deferens. *L. p.*, Lobus posterior. *S. d.*, Submucous glands. *S. w.*, Sphincter prominence. *V. s.*, Vesicular seminalis. *W.*, Mucous membrane wound. (Tandler and Zuckerkandl.)

to 2–3 cm., expresses the extension of the middle lobe outside the bladder. Thereby the external form of the prostate is so changed as to present a more globular appearance.

Of especial interest are the investigations of Tandler and Zuckerkandl on the question of anatomic regeneration following the operation of prostatectomy. Figure 12 illustrates a sagittal section made through the pelvis of a man who had died in the first week after operation. This shows in the first place a massive hypertrophy of the vesical musculature. The inferior part of the cavity is narrowed, covered with mucous membrane and forms an entrance to the wound. The mucosa ends at the superior margin of this and corresponds in its limits to about the location of the sphincter mass. Immediately beneath the latter is the irregular, relatively small cavity of the wound. This measures in the anteroposterior diameter about 1.5 cm.; in the transverse diameter about 2 cm. At the inferior end of the wound is the beginning of the retained prostatic portion of the urethra. The edge of the urethral mucous membrane is well defined. The walls facing the cavity of the wound are uneven and covered on several places with clots. The structure of the walls is as follows: In front are the remains of the lobus anterior, principally its muscular element; behind and below is the atrophied lobus posterior, separated from the cavity by the caput gallinaginis and the ductus deferentes; posteriorly the wall is formed of fibrous bundles, which are situated between the cavity of the wound and the ductus deferentes and which, because of their location, can be the remaining portion of the lobus medius prostatæ; the superior wall presents the sphincter mass, which overtops the lateral walls, and gives passage to the canal leading from the cavity of the bladder. Compared with the conditions following prostatectomy on the cadaver (Fig. 4) it is seen that the cavity of the wound is smaller than the enucleated tumor. This is to be attributed to the contraction of the walls. It is to be noted that the vertical diameter of the wound is very considerably shortened, and thereby the edges of the vesical mucosa and the urethral stump are approximated. Moreover, the space which lodged the vesical portion of the hypertrophied prostate above the sphincter is diminished, its lateral walls and base are contracted, so that there exists only a narrow funnel as an entrance to the wound beneath the sphincter. Figure 13 illustrates an ex-

ternal view of the remaining prostate. The gland has almost preserved its normal form and dimensions, and to be particularly noted is the nearly normal relations of the ductus deferens to the juncture of the prostate and the vesical wall. This condition is due to the contraction of the capsule after the removal of the middle lobe. The contrast between the external appearances of the hypertrophied prostate and the conditions following prostatectomy performed postmortem, on the one hand, and those found on the cadaver, where the enucleation of the mass had been done intra vitam, is made evident by a comparison of figures 4, 10, 11, 12, 13. Tandler and Zuckerkandl remark that in but two of their five cases the colliculus was preserved, but that the ductus deferentes, with the exception of the one case, which had been operated by the perineal route, were present and separated from the cavity of the wound by the remains of the lobus medius.

As an illustration of the late postoperative anatomic changes, the above investigators describe the regenerative process noted at autopsy two years after prostatectomy. The cause of death was arteriosclerosis. Since operation the patient had completely normal function of the bladder. In this case, after the removal of the hypertrophied prostate the operator had united the urethra to the vesical stump with catgut. On sagittal section (Fig. 14) the small, thick-walled bladder is seen descending almost vertically as a narrow tube, which, after a course of about 2 cm. bends quite sharply forwards. At this point there is a small dilatation. The tube connecting this widened area with the vesical cavity is not urethra, but transformed bladder. In this dilated area a band of scar tissue, which begins at the perineum, terminates. At the same place the curvatura perinealis recti is also adherent. The dilatation represents the juncture of the bladder with the urethral stump. No where is a stricture of the urinary canal to be noted.

It is evident that the apparent orificium urethræ internum does not correspond to the true vesical opening. The contraction of the circular musculature of the bladder, especially the sphincter portion, has narrowed the lower

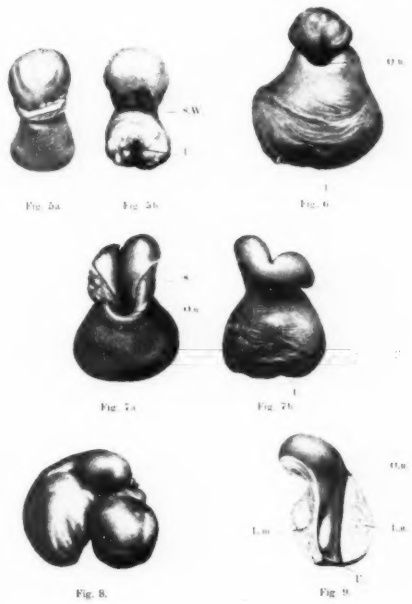


Fig. 5. Prostate removed by the vesical route. *a*, anterior view. *b*, posterior view. *S. W.*, furrow produced by the sphincter prominence. *U.*, urethral opening. (Tandler and Zuckerkandl.)

Fig. 6. Prostate removed by the vesical route. *O. U.*, Orificium urethræ vesicale. *U.*, Urethral opening. (Tandler and Zuckerkandl.)

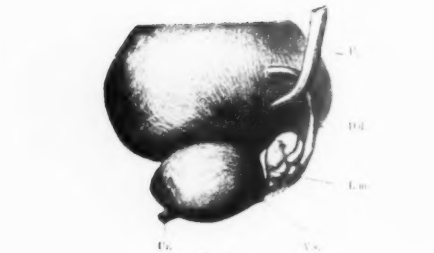
Fig. 7. Prostate removed by the vesical route. *a*, anterior view. *b*, posterior view. *O. u.*, Orificium urethræ vesicale. *U.*, Urethral opening. (Tandler and Zuckerkandl.)

Fig. 8. Prostate removed by the vesical route. Anterior and superior view. (Tandler and Zuckerkandl.)

Fig. 9. Specimen No. 7. Median section. *L. a.*, Lobus anterior. *L. m.*, Lobus medius. *O. u.*, Orificium urethræ vesicale. *U.*, Urethral opening. (Tandler and Zuckerkandl.)

part of this organ, thereby forming a canal. It is possible that this narrowing is favored by the fact that the longitudinal detrusor fibers, which are connected with the vesical floor, were severed.

Of physiologic interest is the fact that the patient did not suffer from disturbance of the bladder's function. Consequently, although at least a part of the bladder was transformed functionally into urethra, continence remained, from which the intact efficacy of the sphincter can be inferred. Therefore, in the restitution of the normal function the inferior



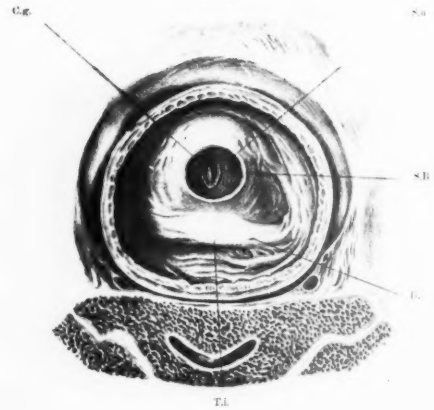


Fig. 10. Hypertrophied prostate together with bladder. Case in Fig. 1, external view. *D. d.*, Ductus deferens. *L. m.*, Lobus medius. *U.*, Ureter. *U. r.*, Urethra. *V. s.*, Vesicula seminalis. (Tandler and Zuckerkandl.)

Fig. 11. Floor of bladder and cavity of wound after vesical prostatectomy, performed postmortem. View from above into the cavity of the wound. *C. g.*, Caput gallinaginis. *S. B.*, Margin of incision in the vesical mucous membrane. *S. u.*, Margin of incision in the urethral mucous membrane. *U.*, Opening of ureter. (Tandler and Zuckerkandl.)

Fig. 12.

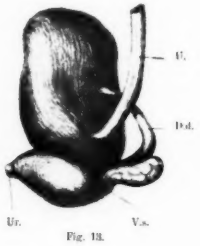


Fig. 13.

Fig. 12. Sagittal section through the pelvis of a man who died six days after a prostatectomy by the vesical route. *C. g.*, Caput gallinaginis. *D. e.*, Ductus ejaculatorius. *L. p.*, Lobus posterior. *S.*, Margin of the vesical mucous membrane. *W.*, Wound in the apex of the bladder, through which a drain passes outwards (Tandler and Zuckerkandl.)

Fig. 13. Prostate and bladder of figure 12 viewed externally from the side. *D. d.*, Ductus deferens. *U.*, Ureter. *Ur.*, Urethra. *V. s.*, Vesicula seminalis. (Tandler and Zuckerkandl.)

part of the bladder together with the sphincter forms the urethra. This process is facilitated by the circumstance that after the removal of the hypertrophic prostate the entire bladder can descend and consequently is enabled to approximate the distal urethral portion, which is fixed to the pelvic floor by the diaphragma urogenitale.

Tandler and Zuckerkandl conclude from their observations in this series of cases that the hypertrophy effects without exception the portion of the prostate which is turned towards the bladder. Therefore, basing their opinion upon anatomic grounds, they state that, aside from considerations of operative technique, prostatectomy performed through the vesical route is the method of choice. These investigators further say: "As a principle, we should like to insist here, that on surgical grounds we can hold only that method as justified in which the operation is performed under the guidance of the eye. The anatomic knowledge gives us the right to reject those methods by which the operator in some manner removes the prostate from its position with obscured finger."

The operative procedure recommended by the above authors: After opening the bladder

the edges of the wound are to be retracted and the relation of the prominent prostatic part to the bladder must be exactly established. Also the trigonum, the plica interureterica, and the positions of the ureteral openings are to be noted before enucleation is begun.

The incision of the mucous membrane encircles the vesical opening; its situation in relation to this opening depends upon the circumstance whether the hypertrophied prostate projects into the lumen of the bladder or whether, in the absence of such a prominence, the entire trigonum is elevated. In the former case, the incision must be made centrally from the limiting groove between the prostatic mass and the vesical floor. Here the opening of the bladder is to be considered the center. This groove indicates to us at the same time the position of the vesical sphincter muscle. A deep incision made peripherally to this place may pass to the outer surface of the prostate, partially destroy the sphincter, and therewith the question of functional restitution would be involved. By this procedure the veins of the plexus Santorini could be injured and cause severe, even fatal hæmorrhage. Finally in this way it is possible to open the connective tissue spaces of the pelvic floor. An indication of this incorrect course, in which the operation is extra capsular, is the fact that in its removal the prostate must first be freed from seminal vesicles and ductus deferentes, which are visible in the wound.

If the hypertrophied prostate does not project into the bladder, the incision can be made nearer to the vesical opening, yet not too closely or in the urethral canal, since, in order to avoid a recurrence, the submucous prostatic elements (glandulæ supraprostaticæ) should be removed with the hypertrophied organs.

The tumor is then to be freed as completely as possible from the vesical wall and the sphincter. This separation is accomplished very easily when made in the correct plane. The smooth-walled mass is soon free on all sides and is only fixed at its base by a pedicle, the distal portion of the prostatic urethra. If this pedicle be torn through, which usually happens, then it is a matter of chance whether the point of separation be proximal or distal

Fig. 14. Sagittal section through the pelvis of a man who died two years after a prostatectomy by the perineal route. *B. m.*, Musculature of the bladder. *M. v.*, Mucous membrane of the bladder. *N.*, Cicatrix passing through perineum. *S. i.*, Sphincter internus. *V. s.*, Vesicula seminalis. (Tandler and Zuckerkandl.)

to the colliculus seminalis. Therefore, it is proper, after enucleation of the tumor, to sever the urethral pedicle as nearly as possible to the surface of the mass. This is accomplished with a suitably curved scissors and by approaching the pedicle along the posterior border of the isolated tumor. By this method injury of the colliculus seminalis and the ductus deferentes is avoided.

After removal of the tumor there occurs a diminution of the wound through the action of the musculature of the walls.

Since severe hæmorrhage takes place only in the cut edges of the mucous membrane it is recommended to insert here a preventive suture. After removal of the mass hæmostasis is scarcely possible, because of retraction of the vesical flap. With the aid of the suture-ends this procedure renders tamponing easy and visible after prostatectomy. Further packing of the bladder may then be omitted. The only other bleeding is a slight amount from the severed urethra.

Etiology. With regard to the etiology of prostatic hypertrophy no hypothesis has yet been advanced adequately harmonizing the

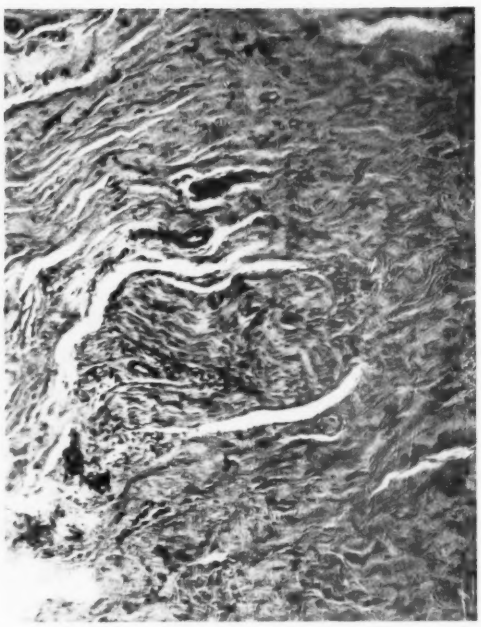


Fig. 15. Fibrous hyperplasia, advanced.

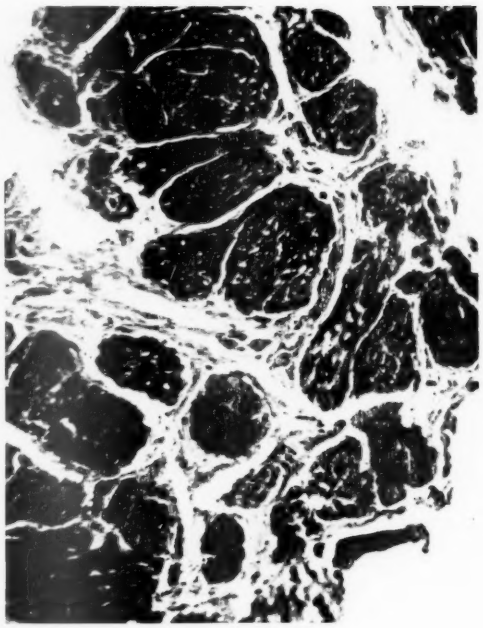


Fig. 16. Hyperplasia of muscle.

facts. The following, however, are worthy of brief discussion:

(1) Is the disease an inherited or family tendency? Larbaud speaks of it as an inherited predisposition, and several writers have noted prostatic hypertrophy in sons whose mothers had disease of the thyroid or myomata of the uterus. These, however, may, we think, be considered merely as coincidences.

(2) Is it a normal phenomenon of senility? It is true that it is a disease of old age, rarely occurring before the fiftieth year. Its occasional occurrence in young men as noted by many observers may be accounted for as instances of premature senility. On the other hand, routine autopsy examination of individuals of the same age, namely, from 60 to 90 years, show that only about one-third of males are affected by genuine hypertrophy and in only about one-half of these are symptoms of the disease present.

(3) Is the disease analagous to the formation of fibroid tumors of the uterus? Velpeau advanced this hypothesis at a time when it was supposed that the prostate was the analogue of the uterus, and also when it was assumed that all uterine fibroses were true tumors. We now know that the prostate is not the analogue of the uterus, that many uterine fibroses are not true tumors, while at the same time we know as little about the real etiology of uterine fibroids as we do of prostatic hypertrophy.

(4) Is the disease referable to errors of alimentation, as overfeeding, alcoholism, constipation, etc? Joss, in a study of the mortality records of 400 cases of prostatic hypertrophy, notes a predominance of the disease in the city over the farming districts, it being over twice as frequent in the city as in the country. Joss thinks that these findings support the hypothesis that overfeeding and sedentary occupations, producing as they do blood stagnation in the pelvic organs, are etiologic factors in the disease. In our series of cases, however, two-thirds of the patients are from farming communities and but one-

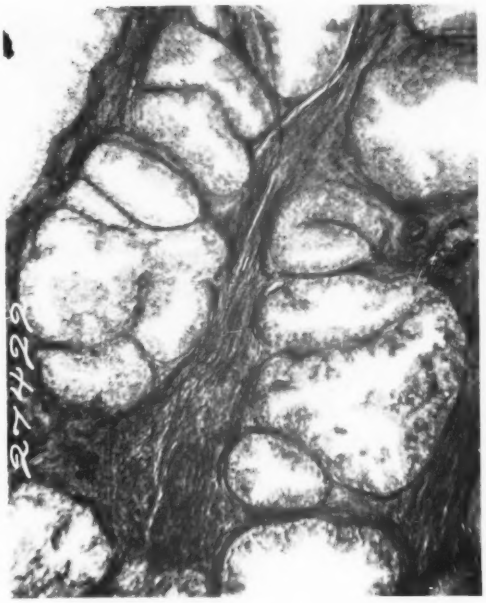


Fig. 17. Parenchymatous hypertrophy.

Fig. 18. Parenchymatous hyperplasia.

third engaged in sedentary occupations. Bruni, in a study of 1,000 patients in poorhouses, considers the abuse of alcohol as an important etiologic factor. Rochet and Romme describe a so-called "false prostatism" in alcoholics which shows a great similarity to a true prostatic hypertrophy, and Rochet warns against confusing these "drinkers' prostates" with genuine hypertrophy, believing that many failures in prostatectomies may be ascribed to this false diagnosis. No doubt alcoholic stimulants, excessive feeding, chronic constipation, irritating diuretics, etc., do cause temporary congestion of the prostate as they do of the pelvic organs in general, but their relationship to prostatic hypertrophy must be considered, as Socin remarks, more as facts revealing to both patient and doctor the hitherto undiscovered enlargement of the prostate, than as causing it. This seems to be the opinion of most observers of experience.

(5) Is prostatic enlargement the result of hyperæmic processes brought about by overstimulation during sexual life? A few writers have placed the beginning of prostatic hypertrophy as coincident with the period of greatest sexual activity and trace back its real origin to sexual excesses. Some have even gone so far as to make the observation that few men over 20 years of age have a normal prostate. The latter opinion is certainly at variance with the experience of most observers in making routine autopsies. Of our patients, 78 per cent were married, 18 per cent were widowers, and four per cent were single. These figures agree approximately with those of other observers. It should be noted, however, in regard to the high percentage of married men and widowers that the marriage relation does not furnish a correct measure of sexual excess. Young notes particularly that the history of sexual overindulgence is not a necessary precedent.

(6) Does prostatic hypertrophy result from acute and chronic prostatitis, gonorrhœa, vesicular calculi, etc.? Griffith, Ciechanowski, Rothschild, and others, urge the importance of the rôle of chronic prostatitis in the etiology of prostatic hypertrophy. They

Fig. 19. Parenchymatous and fibrous hyperplasia.

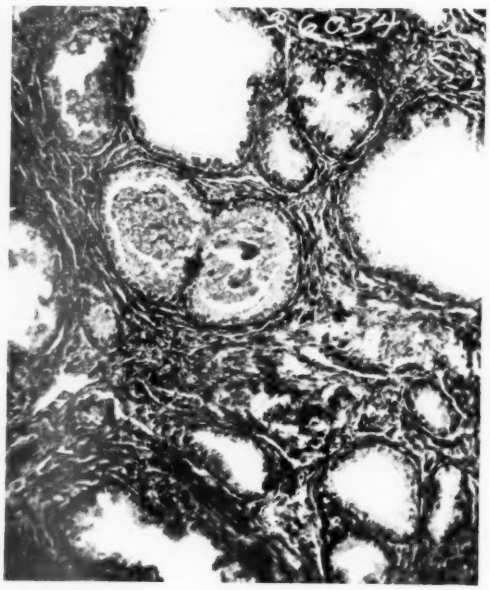


Fig 20. Glandular hyperplasia, beginning desquamation.

assume that the primary stage of prostatic hypertrophy is inflammatory changes in the glandular acini, the second stage being a transformation of the periglandular infiltrate into fibrous connective tissue, producing a diffuse glandular and muscular hypertrophy. On the other hand many observers (Motz, Finger, Rovsing, Pilcher, Young, Von Frisch, Keyes, Tsunoda) express themselves as opposed to the view that inflammation is an etiologic factor, for the following reasons: (*a*) prostatic hypertrophy is frequently observed in old people who have never suffered from gonorrhœa or other inflammations of the genitourinary organs sufficient to produce symptoms; (*b*) early stages of prostatic hypertrophy show no constant time relationships with late stages of gonorrhœa; (*c*) the symptoms of prostatic hypertrophy following gonorrhœal infection usually arise much too late after the cessation of the symptoms, though the possible presence of chronic gonorrhœa in the latent form must not be forgotten. Rovsing reports 142 cases of prostatic hypertrophy of which 93 (65 per cent) had never had urethritis and in whom not a single sign of recent or old gonorrhœa was present. Socin-Burckhardt state that in two-thirds of their cases no previous inflammations were demonstrated, and Raskai has found in the examination of 237 old men prostatic hypertrophy more frequent in those who never had suffered from gonorrhœa. Young notes that out of 145 of his patients only 46 had had gonorrhœa. He says: "My statistics tend to disprove Ciechanowski's assertions that the etiology of prostatic hypertrophy is a chronic inflammation." We may add that our statistics confirm Young's observations. (*d*) The frequent occurrence of round celled infiltration either in circumscribed areas or diffused has been interpreted by Ciechanowski and others as terminal evidence of inflammation. It is, however, an open question whether in the cases in which it is not true lymphoid hyperplasia, that it is not the result of secondary inflammation following degeneration of the tissue elements in the gland already hypertrophied. (*e*) The more usual end result of inflammation is atrophy and not hypertrophy.

Fig. 21. Glandular hyperplasia, retained secretion, desquamation.

Fig. 22. Glandular hyperplasia, beginning cyst formation.

(7) Is prostatic hypertrophy an end result of general febrile disease, as tuberculosis, rheumatism, gout, etc.? The ascription of prostatic hypertrophy to these causes represents a blind grouping of etiologic factors without a proper consideration of the facts in the history of the patient.

(8) Is it due to arteriosclerosis? Guyon, Launois, and others of the French school are inclined to teach that senile enlargement of the prostate is only a local sign of a general arteriosclerosis of the urinary apparatus. They state that in the kidney this process extends from the glomeruli to the parenchyma; affects the bladder in the same way, where, in the formation of sclerotic connective tissue in the submucosa, compression upon the contractile elements interferes with their action. The process extends finally to the prostate, whose arteries are narrowed and partly obliterated. In all vessels of the urinary tract, they state that they can demonstrate an endo- and periarteritis, and that the entire process of prostatic hypertrophy is associated with arteriosclerotic degeneration in the entire arterial system. Guyon describes vesical prostatism as a condition in which the symptoms of prostatic hypertrophy are developed in the last stage of distention of the bladder and dribbling, the prostate furnishing no obstruction to the emptying of the bladder. He holds that the primary changes represent only atrophy of the bladder musculature, the muscle bundles being pressed apart and permeated with newly-formed connective tissue. These changes he attributes to arteriosclerosis. Some authors who support this opinion speak even of a prostatism in women. Desnos reports the examination of 100 women over 65 years of age, 48 of whom showed different grades of symptoms, such as are present in man in the first stages of prostatic hypertrophy: "Frequent micturition during the night, slow and retarded emptying of the bladder, and often the sensation of unsatisfactory urination." The suffering in women never passes this first degree, owing to the simplicity of the urinary exit, in consequence of which distension never occurs. As against this view, Casper notes that while hypertrophy of

Fig. 23. Cyst with degenerated epithelium.

Fig. 24. Cysts filled with epithelium.

the prostate and arteriosclerosis of the genito-urinary tract are frequently present together they do not occur in an etiologic relationship. In his 24 cases of prostatic hypertrophy only 8 or 9 showed endoarteritic changes in the vessels of the bladder and only 4 in those of the prostate. In 4 other cases in which the prostate was not enlarged there were endo- and periarteritic processes demonstrated in the vessels of the urinary apparatus. Motz, in 31 hypertrophied prostates, notes that the vessels were normal in 16 cases, in 6 there was simple congestion without vascular changes, and in only 9 was the number of vessels increased, these being affected with endo- and periartoritis. Of 14 cases with very voluminous prostates, 9 had normal blood-vessels. Motz holds therefore, that arteriosclerosis in the urinary tract itself does not cause prostatic hypertrophy, though certainly enlargement of the prostate through congestion of the urinary tract may be caused by arteriosclerosis of the vascular trunks. Young, in 54 prostates, found arterial thickening in only 10. In our cases only a relatively small number showed any marked arteriosclerosis. From the theoretic standpoint, Casper raises the point that in all the field of general pathology there is nothing analogous to hypertrophy through degeneration of the vessels, but that atrophy, e. g., degeneration of the heart musculature in arteriosclerosis of the coronary arteries, contracted kidney through sclerosis of the renal arteries, etc., is the usual end result.

(9) Is it a compensatory process in order to affect hypertrophy of the muscles of the bladder? While it must be conceded that the prostate is mechanically concerned in the evacuation of the urine, yet the hypothesis that its hypertrophy occurs as an attempt on the part of nature to build a bulwark to prevent urinary dribbling from hypertrophied bladder walls seems, on the face of it, to lose sight of the sexual function of the prostate and also of the fact that vesicular hypertrophy is usually a secondary and not a precursory condition of prostatic hypertrophy.

(10) Is the process of prostatic hypertrophy neoplastic? Virchow held that prostatic hy-

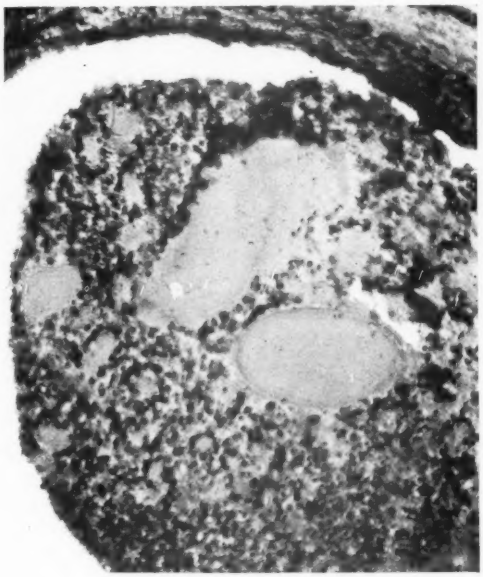


Fig. 25. Cyst with corporamylacæ and epithelium.

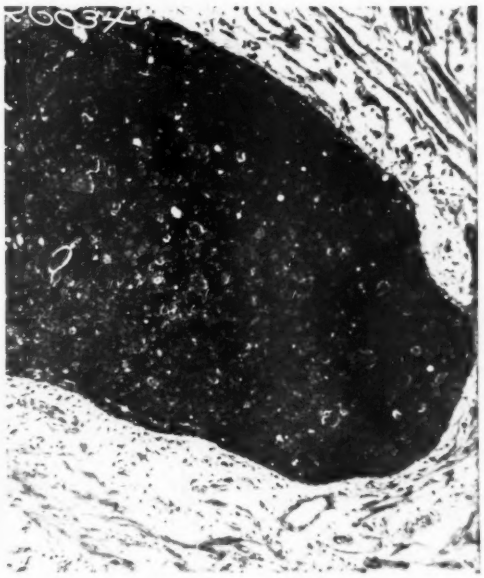


Fig. 26. Lime salts and epithelium.

pertrophy was due to the formation of lobular myomata. He admitted the existence, however, of a rare form of prostatic hypertrophy produced solely by the development of glandular tissue. The consideration of prostatic hypertrophy as a true tumor formation has so little to support it that it needs only to be mentioned here.

(11) Is the presence due to the absence in declining sexual life of some internal secretion from the testicles which normally regulates (i. e., inhibits) the growth of the prostate? It is conceivable that the prostate in its capacity as an essential part of the sexual apparatus should undergo a compensatory hyperplasia to offset atrophy in another essential part of the sexual apparatus, which has arisen through excessive use or advancing age. It is possible that in its twofold sexual function, first in relation to fecundity, and second, in relation to sexual desire, that after the first function, i. e., stimulation of the spermatic motility, ceases to be necessary, that compensatory hyperplasia of the gland may develop to further its second and more prolonged sexual function, viz., that of the stimulation of sexual desire.

MacEwen associates prostatic hypertrophy with atrophy of the testicle through a deficiency in a hypothetic internal secretion which regulates the process of development of function of the prostate. That there is a marked relationship between the development of the prostate and the testicles is shown by the well-known observations of many authors that, after castration, the prostate atrophies. But this relationship is apparently such as would lead one to expect in the declining years of diminishing sexual activity, with diminution of the secretion of the testicle, an atrophy of the prostate, and not a hypertrophy.

(12) Is the process a compensatory provision to supply a stimulus to a testicle with declining function? Rovsing, having in mind Fürbringer's demonstration, that the physiologic function of the prostate lies in the production of a secretion which stimulates the vitality and motility of the zoösperms, looks upon prostatic hyperplasia as a purely reflex attempt on the part of nature to compensate for a beginning senile insufficiency, that is, through quantitive increase of the prostatic secretion to make up for the decrease in quality. Serralach and Pare's apparent de-

Fig. 27. Tuberculosis.

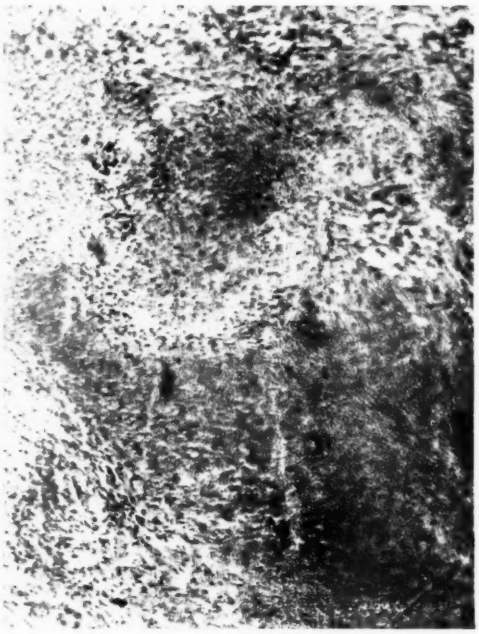


Fig. 28. Tuberculosis.

monstration that there exists in the prostate an internal secretion which stimulates the development of the spermatazoa, is an important observation in this connection.

It is possible that when the testicles have reached nearly their limit of zoösperm production that nature attempts to provide from the prostate an excess of a normal stimulant for the declining process.

(13) Is the hypertrophy caused by urethral stricture, as has been advanced even recently? The arguments against inflammation (see 6) are equally forceful here. In only 8 of Young's 46 cases of hypertrophy with a history of gonorrhœa was stricture present. v. Frisch states that the association of stricture with hypertrophy is relatively rare, but that the former is the most frequent cause of pressure-atrophy, which is due to the stagnation of the urine in the pars prostatica urethra.

Whatever may be the initial stimulant or the broad biologic factor which lies at the base of the prostatic hypertrophy, we are inclined to think that the following steps represent the usual development of the disease:

There is an initial hyperplasia of the parenchyma marked microscopically by high cylindrical epithelium with swollen nuclei, which resembles in all respects actively secreting epithelium in other well studied glands. That these epithelial cells are actively secreting is further shown by the presence in early stages of relatively large amounts of secretion, which is distinguishable grossly from that of the normal prostate. This parenchymatous hyperplasia is frequently so great as to result in the development of marked infoldings of, and papilliferous proliferation from, the alveolar walls, sometimes carried to the extent of completely bridging the alveoli.

Apparently the second stage of hyperplastic development, though not a definitely limited one, is that of retention within the alveoli and tubules of the secretion. This retention may be due to beginning exfoliation of the epithelium, and it may be due in part to blocking of the excretory ducts of the in-

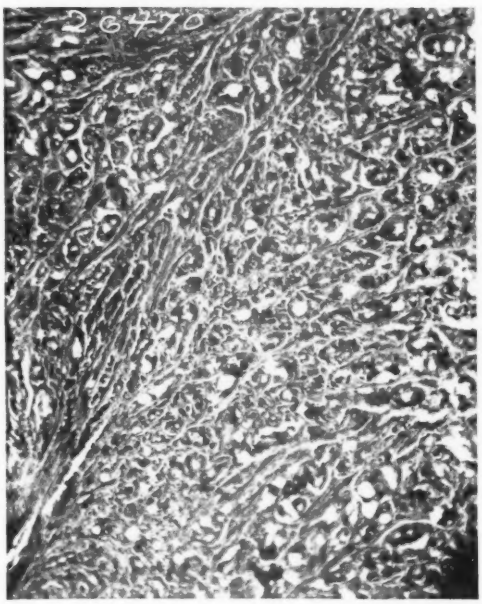


Fig. 29. Adenocarcinoma.

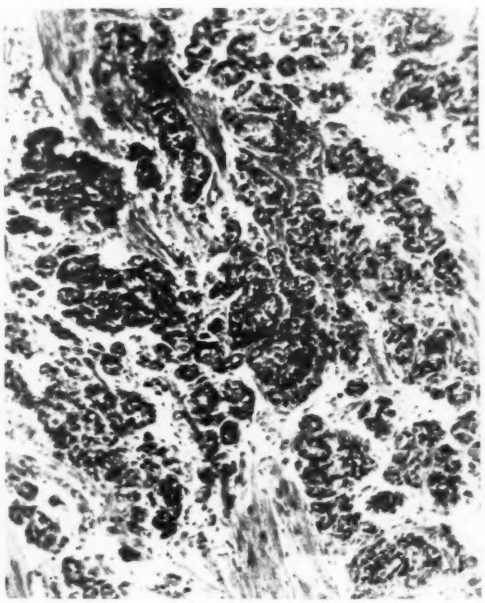


Fig. 30. Adenocarcinoma.

dividual gland units by a beginning concomitant muscular hyperplasia.

The third stage is parenchymatous degeneration, which in the hypertrophied prostate is marked by atrophy or exfoliation of the epithelium. The first of these processes is shown by the flattening of the epithelial cells, the reduction in size of the nuclei, and the diffuse staining of their protoplasm. The second process, exfoliation, may and frequently does occur in epithelium which is still in the high columnar, secreting phase. Atrophic epithelium is usually associated with swollen cystic acini. Exfoliations occur in any acini, but are densest and best preserved in large acini. Exfoliation may be so extensive as to present a picture of completely denuded alveoli, or cyst walls. The stripping of the epithelium from the papilliferous projections and alveolar bridges leaves these as slender, fibrous projecting or bridging structures.

Early in the development of parenchymatous hyperplasia there begins a muscular overgrowth which represents, apparently, an attempt on the part of nature to expel from the gland the retained secretion. Our cases, however, do not show a large percentage in which the muscular hyperplasia greatly outweighs the element of fibrous connective tissue overgrowth.

The overgrowth of fibrous connective tissue in the hypertrophied prostates in our cases is the most constant factor, though it must be borne in mind that many cases coming to operation may fairly be assumed to have long passed the stage of active parenchymatous and muscular hyperplasia. The fibrous connective tissue may well have its origin not alone in acting as a supporting framework for the increased glandular elements, but also in metaplasia of the smooth muscle elements. In the normal prostate the muscular and fibrous connective tissue are so blended that it is readily conceivable that with overgrowth and overfunction the unstriated muscle fiber may, by steps of gradual transition, change into fibrous connective tissue as a terminal stage in the life history of the muscle cell.

Atrophy: *Etiology.* Atrophy of the pros-

Fig. 31. Medul. carcinoma.

Fig. 32. Hyperplasia, carcinoma; showing fibrous septum.

tate is introduced by very dissimilar processes, and can result from different kinds of retrograde metamorphosis.

The principal causes cited are: Congenital malformation in association with other congenital anomalies of the urinary and the sexual tracts, particularly with abnormalities of the testicles; inflammatory processes in the testicles, which lead to destruction of the secreting parenchyma through suppuration and cicatricial formations; castration in the adult, where the prostate is normal, in which case there is at first atrophy of the glandular portions, and later, of the fibromuscular stroma; exhausting diseases, among which tuberculosis is the most frequent cause; compression, in which the prostatic tissue becomes atrophied from continuous mechanical pressure; suppurative processes in the prostate, and senility.

With regard to the changes subsequent to castration, we must differentiate between castration performed before puberty and after puberty. In the former case we are not dealing with atrophy, but with an inhibition of growth. The latter case is a genuine atrophy.

It seems very doubtful up to the present time that true atrophy ever results after castration in the presence of hypertrophy of the prostate, although it cannot be denied, that a diminution of the gland can occur in consequence of an operation on the genital system.

Atrophy of the prostate associated with exhausting diseases is found in connection with a uniform atrophy of all the body structures.

Atrophy resulting from continuous mechanical pressure can be produced by tumors in the neighborhood of the prostate — abscesses, cysts, new growths of bone, and the like — or by the formation of concretions in the bladder or in the prostate itself. The most frequent cause of this form of atrophy is the urethral stricture. Hereby the consumation of the tissue of the prostate results from the constant pressure of the stagnating urine upon the stricture in the pars prostatica.

The suppurative processes associated with atrophy are gonorrhœal prostatitis, tuberculosis, and metastatic prostatitis. In these cases the condition can reach such a high

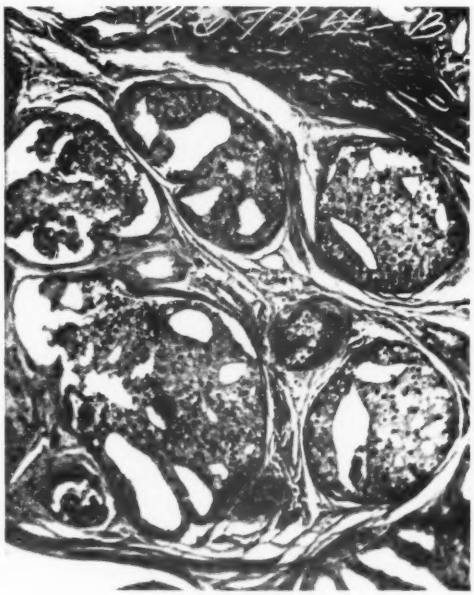


Fig. 33. Duct carcinoma.

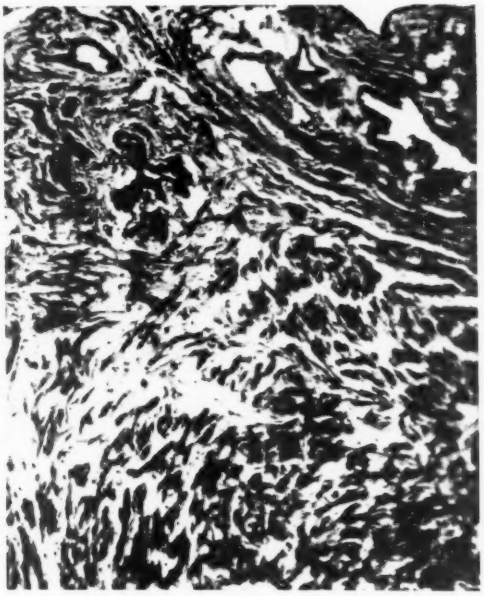


Fig. 34. Scirrhous carcinoma.

degree that the prostate appears completely destroyed. Frisch considers it incorrect to designate as atrophy the destruction produced by these inflammatory processes.

Senile atrophy is to be considered as prostatic atrophy in the narrower sense, since it can occur in advanced age without a definite cause, or, at least, a cause that has up to the present been established.

This form is usually represented as the reverse of hypertrophy, a view, however, which is only based upon the external signs of decrease in weight and volume. Most observers state that senile atrophy does not develop before the fiftieth year. Opinions differ widely with regard to its frequency. Many observers state that it is present more frequently than hypertrophy; others declare it to be rare. Thompson found atrophy at autopsy 11 times in 164 men over 60 years of age, Messer, 20 times in 100, also over 60 years, and Dittel and Christiana, 36 times in 115 men between 52 and 100 years (atrophy 30.3 per cent against hypertrophy 15.6 per cent). The latter figures, differing so widely from other opinions, have been ascertained not at autopsy, but on the living, and Frisch contends that those findings should not be attributed to senile atrophy, but to contractive processes in consequence of different inflammatory conditions previously undergone. Burckhardt describes prostatic atrophy as a rare disease. In 1,673 patients suffering from surgical affections of the urogenital apparatus he could establish genuine atrophy of the prostate in only 11 (0.65 per cent); in 370 patients, 50 years and over, 7 times (1.9 per cent); in 1,303 patients less than 50 years of age, 4 times (0.30 per cent).

Diminution of the prostate in senile atrophy depends upon an atrophy of the entire tissue of the organ, but both lateral lobes often present different degrees of the process.

Pathologic anatomy. In case of atrophy resulting from strictures, especially if these be located in the pars membranacea, the entire pars prostatica assumes a funnel shape, widening toward the bladder. Through the pressure of the stagnating urine, there often occurs considerable widening of the individual excretory ducts of the prostatic glands, which can extend deeply into the organ. The

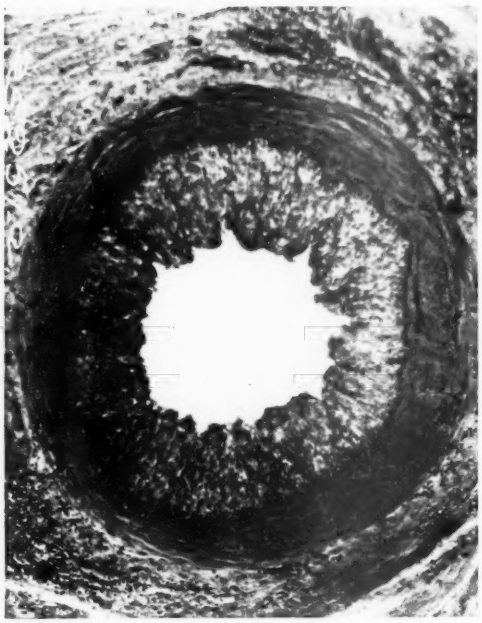


Fig. 35. Carcinoma in vessel

glandular tissue between these diverticulum-like formations is consumed. "In other cases this widening is uniformly distributed to all the excretory ducts and their branches, and the prostate consists for the greater part, of a multi-cellular framework, which communicates with the urethra through sieve-like arrangement of the openings, and these may sometimes contain stones in great numbers." (Socin).

Senile atrophy of the prostate presents a picture similar to atrophy in consequence of castration performed in early life. The organ appears uniformly diminished in size, becomes firmer, and the surface is smooth. In high degrees of atrophy of the lateral lobes may be decreased even to the size of a pea. The cut surface may present no glandular tissue whatever or only small remains, and microscopic examination confirms the gross appearance. Where traces of glands persist, these contain defective epithelium and inspissated contents, or from them are developed small cystic cavities which at times enclose corpora amylacia. The muscular fibrillæ undergo fatty degeneration and often are, for the greater part, completely destroyed, so that the tissue is almost exclusively composed of elastic and connective tissue fibers.

Steinlin has described another form, which he names locular senile atrophy. Its origin is explained by atrophy of the originally over-developed glandular elements and the formation by the muscular components of a stiff and dense shell about the degenerated center (Klebs). In this form there is often found on the surface of the pars prostatica a series of deep recesses, in which, at times, relatively thick catheters may become caught. A similar accumulation of cyst-like cavities is shown in this kind of atrophy, especially where calcification of the prostate is present, and these are due to stagnation of secretion in the glandular tubules. Cysts formed from degenerated glands have smooth inner surfaces, and possess here and there a covering of flattened epithelial cells.

Concretions. Corpora amylacea, first described by Morgagni in 1723, may be found in the prostate at all periods of life, though they are more numerous in the aged. They are most numerous in the region of the colliculus seminalis, though they are found also in the alveoli and ducts throughout the gland. They are usually rounded or oval in form, and from 20 microns to one mm. in diameter. The smallest are almost colorless; the largest, amber, dark brown, or even black in color. When of the latter color they frequently give, in the prostates of the aged, the "peppered" appearance seen on gross section. Microscopically, they consist of a nucleus usually containing cromatin, surrounded by stratified material which shows occasionally surface markings similar to potato starch granules. This appearance and the fact that they give an indistinct violet color with iodine suggested the name "corpora amylacea." These bodies have no relationship to true starch. Their surface markings being produced by the irregular accretion of epithelial cells, and the blue color with iodine, being due to the lecithin of the composition. It is probable that they are most frequently produced by desquamated epithelium, the result of chronic

inflammation. Posner and Eastman have separately shown that concretions may also arise through direct transformation of the epithelium, a process beginning before its desquamation. Stilling thinks that the presence of these bodies in the young may be accounted for by the degenerations of the central portions of the epithelial cords, a process in the development of the ducts from the embryonic cordon phase of the glands, the musculature of the glands not being sufficiently developed in youth the concretions are not expelled; a condition which may be repeated again in old age through degeneration of the musculature. The pigment is derived from the epithelium and from the blood.

Virchow has described a similar structure in the so-called female prostate, where they may reach one mm. in diameter and project above the surface of the mucous membrane of the urethra.

Within and around the corpora amylacea deposits of lime salts (basic phosphates, carbonates, triple phosphates, and occasionally oxalates) may occur. Thus are formed hard, opaque prostatic stones, which may attain enormous size, cases having been reported in which individual stones weighed from 100 to 300 gms. Occasionally they are very numerous, 50 to 180 in a single prostate. When they are numerous they become facetted as do gall-stones, by attrition with each other.

Prostatic stones may produce no symptoms at all, or they may set up chronic inflammation of the gland or even extensive suppurations. Since lime salts are an essential element of their composition they are opaque to the Röntgen ray, a fact to be considered in diagnosis.

Neoplasms. The observations of more recent times emphasize the fact that malignancy of the prostate is a comparatively frequent disease and should always be kept in mind in the examination of this important organ. Furthermore, it has been the experience of investigators that malignancy can be present in this gland and escape detection even on careful examination of the gross specimen. Enlarged prostates have been removed at operation and carcinoma not suspected until careful microscopic examinations revealed a small malignant area. Instances are cited in the literature where presumably simple hypertrophied glands have been extirpated and later carcinoma found in the external cicatrices. It is evident, therefore, that from the standpoint of operative procedure, whether this is to be radical or not, and that of prognosis, a most careful examination of the prostate with regard to malignant conditions is of vital importance.

The extremely limited recognition of malignancy in the prostate up to the time of Thompson's contribution in 1854, and the gradual increase in its recognition from that date to the present, are a stimulus to keener observation and study of this organ with regard to neoplasms. Tanchou's statistics, compiled by Thompson, showed but five cases of prostatic cancer among 8,289 patients who had died from cancerous disease. Among 548 cases of cancer in the Billroth clinic, von Winiwarter found only one case of prostatic cancer. These figures sufficiently emphasize the extreme rarity of the recognition, in earlier days, of malignancy in the prostatic gland.

In 1854 Thompson contributed the first available statistics on the subject, having cited 18 cases from the English and the French literatures. In 1866 Wyss reported 28 cases, including those of Thompson. Since that time other reports have been made as follows: Socin (1875) 50 cases, Kapuste (1885) 114 cases, Engelbach (1888) 114 cases, Wolff (1899) 110 cases. Young has reported 68 carcinomata among 250 enlarged prostates, which had been extirpated. Belfield has made the observation that 10 per cent of all hypertrophies are carcinomata. In our series of 468 cases there were 73 (15.5 per cent) carcinomata.

Sarcoma of the prostate is relatively rare. Kaufmann cited 24 cases, and 11 others have since been added to that number by various investigators. Although the statistics of some writers have shown a higher percentage than the above, a more exact examination of their material has not confirmed their figures, and indicate that Kaufmann's statistics are to be considered the basis for judgment as to the frequency of sarcoma in this gland.

In this brief historical review may be noted the steady advancement, during the past half-century, in our knowledge of malignant growths in the prostate. Although the statistics of recent investigators vary within somewhat wide limits as to frequency of its occurrence, yet it should be a generally recognized fact that carcinoma of the prostate is a comparatively frequent disease, and that sarcoma, though relatively infrequent, does occur.

Malignancy in the prostate is observed from earliest childhood to late old age. Carcinoma is more prevalent in the latter decades of life, and sarcoma in the beginning years. The middle period is relatively free from malignancy. Ages of our patients with carcinoma:

1 was between 40 and 50 years of age.
9 (12 per cent) were between 50 and 60 years of age.
29 (40 per cent) were between 60 and 70 years of age.
30 (41 per cent) were between 70 and 80 years of age.

These neoplasms may be present in the gland both primarily and secondarily. Cancerous and sarcomatous nodules — the latter by far the more infrequent form — have been observed in cases in which the primary foci were situated in various organs. The primary tumor has been found most frequently in the rectum, less often in the urinary bladder, the seminal vesicles, on the penis, in the stomach (Engelbach), the lungs (Fenwick), and the dura mater. Kaufmann held genuine metastatic growths of the prostate to be extremely rare.

Of our 73 cases, 51 (69 per cent) showed marked glandular hypertrophy, as was evidenced microscopically by papilliferous projections into the acini. In 30 cases (41 per cent) there was definite muscular atrophy, and in 61 cases (83 per cent) the fibrous stroma was increased. In 10 cases (13 per cent) there was no evidence of associated hypertrophy in the sections examined from the glands, leaving 87 per cent in which there was evidence of hyperplasia. Whether in these cases the hypertrophy was primary and the carcinoma implanted thereon, it was impossible to determine, though in many microscopic sections the apparent transition by almost imperceptible variations from simple hyperplasia to undoubted carcinoma was observed.

Pathologic anatomy. Carcinoma of the prostate occurs most frequently as the soft medullary or adenoid type. The scirrhus, colloid, and melanotic types have been observed in isolated cases. Young and Geraghty's description of the gross appearance of cancers of the prostate is so accurate that we quote it herewith: "Carcinoma of the prostate is usually quite characteristic. It is ordinarily hard, tense, and on pressure gives very little sense of elacticity (which is generally not lost even in well advanced fibroid prostatitis). On cutting into the section it imparts a gritty sensation to the knife blade, which is absent in the lobulation so characteristic of hypertrophy. Occasionally, where the cancer has invaded a previously adenoid growth a carcinoma may persist in this tissue, but it is seldom confusing. The finer details of the cut surface varies somewhat, irregularly interlacing bands of varying size are seen, with small grayish-yellow isolated masses scattered here and there. The interlacing bands are fibrous in character, and the yellowish areas, accumulations of cancer cells. This appearance is not present in fibroid prostatitis, in which the epithelial element frequently disappears and in which the surface is much more smooth, and homogeneous than in cancer. Where cancer is infiltrating in character, fine yellowish lines can frequently be seen by the aid of a small magnifying lens. Usually one can be moderately certain of the cancerous nature of the tissue upon gross inspection alone. When the operator's knife, in making capsular incision, cuts through tense tissue which does not bulge, the edges of which are firm and ridged, suspicion should be at once aroused." It has been our experience that carcinoma is in no tissue, with a possible exception of small tumors of the breast, removed at the surgical clinic, more apt to escape diagnosis grossly than that of the prostate, so that it is our inevitable custom to make frozen sections from various areas of the removed gland and report to the surgeon while the operation is in progress.

Microscopically, the adenocarcinomatous

tissues present a great variety of arrangement. The acini of the tumor may be small, numerous, and grossly crowded together with compressed cylindrical cells of aberrant type, or they may be large and loosely filled with aberrant cells containing metachromatic nuclei. In most instances cancer cells infiltrating the stroma are readily demonstrated.

In medullary carcinoma the cells are relatively large, polygonal in type, with a swollen chromatophilic nucleus. The cells are supported by a delicate capillovascular network.

The scirrhus types show infiltrating lines or groups of aberrant cells with densely staining nuclei scattered throughout a superabundant stroma. The stroma itself is frequently infiltrated with small cells containing densely stained nuclei and is apparently proliferating.

Etiology. The etiology of carcinoma of the prostate is completely unknown as is that of carcinoma elsewhere. Albarran and Hallé insist upon a definite relationship between prostatic hypertrophy and carcinoma. Among 86 hypertrophied prostates they found in 12 epithelial changes, which they thought to be different grades of carcinomatous degeneration. They suggest that prostatic hypertrophy has its origin essentially in pathologic processes in the glands which may develop into benign adenomatous formations or, on the other hand, into malignant neoplasms. The conditions suggesting carcinoma were found present in one-tenth of all the prostates examined by them without showing any notable microscopic changes of glands or presenting symptoms deviating from the usual clinical picture of simple hypertrophy. Prédal reports that of 53 prostatectomies 4 cases, requiring a second operation, showed malignant tumors to have developed later, apparently from the external cicatrix. Similar observations have been made by others. However, when one considers the difficulty of accurate diagnosis, especially in cases of carcinoma of the prostate, all such instances as the above must be regarded with some suspicion, unless all of the tissue of the prostate was removed at the original examination and a careful microscopic investigation made thereof.

While we may consider it fairly well established that isolated epithelium, whether from inherent or external stimuli, exhibits a tendency to proliferate and infiltrate, and while the observations of many workers record series of pictures such as those described by Albarran and Hallé, yet we must be conservative in our interpretation of these apparent transitional stages of hyperplasia into carcinoma. Likewise, we must examine most critically all clinical data such as the observations of Prédal and others suggesting the same line of development.

Metastases. Many prostatic carcinomata show a marked tendency to seize upon neighboring structures, particularly the floor of the bladder, seminal vesicles, and rectum. The lymph glands in the region of the prostate are the first to become infiltrated with cancer. After that, the retroperitoneal and inguinal glands become involved. Metastases to distant organs are common, and should always be as carefully excluded in clinical examination before operative procedure. They are frequently present in the lungs, liver, spinal column, and long bones. Von Recklinghausen, Sasse, Brown, Kolisko, Fritsch, and others have emphasized the importance of seeking for small carcinomata in the prostate, breast, or thyroid in cases in which extensive metastases in the bones have been found at autopsy. Von Recklinghausen says: "If, in the female, cancer of the vertebra breaks forth with unspeakable pain, as a rule, one does not err if he assumes the original focus to be in the breast. In such cases the primary focus may reach only to a very small size." Fritsch says: "Perhaps just as frequently may the causative rôle for general carcinoma in man fall to the lot of prostatic cancer as to the lot of the mammary gland cancer in the female. We know how difficult it is to recognize prostatic cancer with the naked eye, how little it destroys the tissue, how very much more it tends to produce induration so that only the typical involvement of regional lymph glands discovers and facilitates the diagnosis."

Sarcoma. In reviewing the literature one finds these tumors usually described as soft, rapidly growing neoplasms of considerable size. Socin describes one case in a child of

8 months which began between the bladder and rectum and involved the whole pelvic cavity. This tumor was soft, cystic, and colloid in structure. Bree reports a case in a child 9 months old.

Considering the relative frequency of prostatic sarcomata in young children, and the fact that the development must be dated much earlier than the symptoms, Klebs held that it is not unlikely that the beginning of the process may even be referred to the intrauterine period of development.

As prostatic sarcomata develop they involve the bladder wall and neighboring structures. The neighboring lymph glands are usually affected, but distant lymph glands rarely. Metastases to other distant organs, lungs, liver, etc., are also uncommon, though instances have been reported.

With regard to the histologic type of tumor the round cell is the most common, and after this the spindle cell. Angio-, lympho-, myxo-adeno-, enchondro-, leiomyo-, and rhabdomyo-sarcomatous forms have also been reported.

SUMMARY

In conclusion, the writers realize that in presenting this review of the normal and pathologic prostate much valuable work has been necessarily omitted, but, as stated in our introduction, the object is to stimulate a keener interest in this important question, and furnish a basis for future investigations.

The observations of Tandler and Zuckerkandl on a series which rare opportunity made possible, seem to be extremely important, and if the continuation of that work confirms their present conclusions an essential advance will have been made in the surgical aspect of the gland.

The writers have incorporated in the section on hypertrophy the work of these investigators, since it is the most extensive anatomic investigation of the kind that has been done. Whereas many excellent results have been obtained by surgeons who have performed prostatectomy otherwise than recommended by Tandler and Zuckerkandl, it must be admitted that their deductions as to operative method of choice are logical from the premises which that material (42 cases) afforded, and that their excellent contribution will furnish a stimulus for further study of this subject.

The frequency of prostatic disease and the irreparable damage that may result when the conditions are allowed to continue are forceful arguments for the study and careful examinations of the prostate. In case of any doubt, the extirpated gland should be examined microscopically in detail.

It is a regrettable fact that many otherwise well-informed physicians seem to be almost unaware of the existence of this organ. At least they are prone to ignore its rôle in the production of a train of symptoms which they frequently ascribe to a "weak bladder" or "kidney disease." Often patients die of the sequelæ of prostatic hypertrophy, or directly from prostatic carcinoma, without ever having had a rectal examination. Patients have been operated on for chronic appendicitis when their symptoms were really due to carcinoma of an unexamined prostate. In every case of gonorrhœa in the male the possible involvement of the prostate should be remembered and the patient warned, at the time, of the troubles probably in store for him in the future.

A rectal examination should be a routine procedure with all males presenting themselves for diagnosis of obscure abdominal as well as genitourinary troubles.

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DEPARTMENT OF TECHNIQUE

A CONTRIBUTION TO THE SURGERY OF HERNIA

By WILLIAM R. CUBBINS, M. D., Chicago, Illinois
Assistant Professor of Surgery, Northwestern University Medical School; Professor of Surgery, Post-Graduate Medical School; Attending Surgeon to the Post-Graduate Hospital; Adjunct Surgeon, Wesley Hospital

IN making this suggestion in hernial technique I do not wish to assume any credit for the imbrication of the external oblique fascia which, unquestionably, belongs to Dr. E. Wyllys Andrews, but by these illustrations I wish to emphasize the value of the blood supply to the external oblique and the simplicity of the continuous suture in an operation of this type.

In the first illustration the skin has been incised in a line two inches above and parallel to Poupart's ligament down through the subcutaneous fat to the loose fascia which covers the tendon of the external oblique and bears part of its blood supply. The under surface of this tendon has its similar network of vessels. It is well to emphasize here that tendon tissue of the thinness of the external oblique tendon is dependent for its nourishment upon contiguity and not continuity, consequently, when this thin web of vessels is brushed away from the upper surface of the tendon and then this lower flap raised up and the vessels brushed away from the under surface, it is dependent upon the fluids in which it is bathed for its nourishment. When this fluid is sterilized no harm results, because tissues can live in these fluids if the nuclei are not injured, but a very mild type of infection will serve to cause the death of this flap with subsequent sloughing which will leave a defect in the abdominal wall. This is true not only of the operation for inguinal hernias, but also where the fascia is stripped clean in the muscle splitting operations for appendicitis, and only less so in operations through the medium line because of the firm attachments of the muscles to the fascia which makes it more difficult to separate.

In those hernial operations where the cord is placed in a new bed anterior to the deep layer of external oblique fascia and is covered by the lower flap alone and this lower flap sloughs away, the seriousness of loss is easily understood.

In the second illustration the fascia of the external oblique has been incised one and one-half inches above and parallel to Poupart's ligament without opening the external ring and the lower flap retracted and attached to the skin with Ochsner's tacking forceps so that the superficial blood supply cannot be injured. The contents of the canal have been picked up — the sac identified, ligated at its base — removed and the stump allowed to retract. The cord is placed in this normal bed and the needle has grasped the

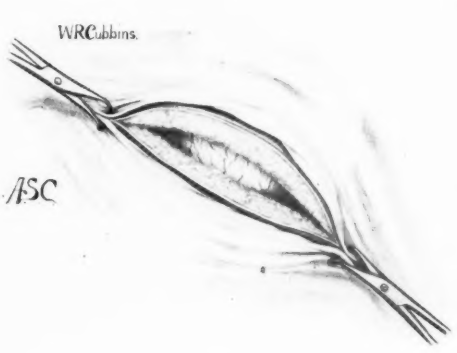


Fig. 1.

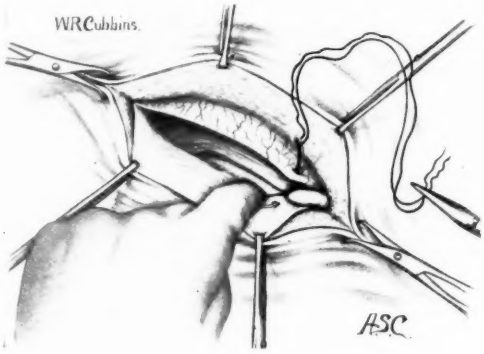


Fig. 2.

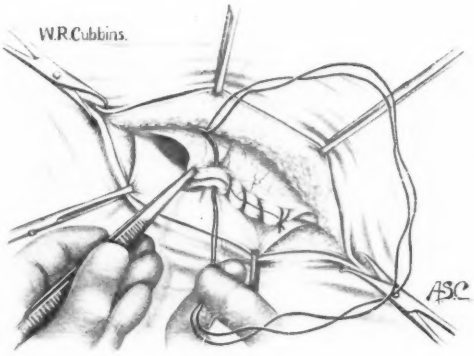


Fig. 3.

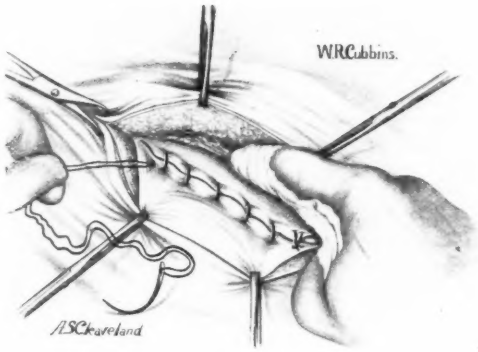


Fig. 4.

edge of the upper flap of the external oblique with the underlying conjoined tendon and has also passed through the shelving edge of Poupart's ligament at such a distance that when tied this opening will admit the tip of the index finger beside the cord. This makes a new external ring.

This same double No. 1 chromic catgut suture is now carried in continuous suture as shown in figure 3 to unite the upper edge of the external oblique and the belly of the internal oblique to the shelving edge of Poupart's over the cord.

In figure 4 this suture has been continued above the internal ring and the gauze covered finger is separating the fat from the upper layer of fascia. This can be done here because it gets its blood supply from below.

The fifth figure shows the side step by which the stitch is carried over, picks up the edge of the lower flap and the external oblique and starts a second row of continuous suture parallel to the first, imbricating the lower weak portions of the external oblique over the upper portion and making three layers of tissue in front of the cord.

In figure 6 the needle has been cut off the end of the double suture and one-half the suture passed through the loop so that it can be pulled taut and tied firmly.

Thus we have used only one suture and tied two knots during the operation. The blood supply of the lower flap is shown in figures 5 and 6 to be in almost perfect condition. The skin is closed with Michel clips and a small dressing composed of equal parts bismuth subnitrate and powdered boric acid is applied because of its mechanical action. Over this a few layers of gauze and the whole is covered hermetically with adhesive plaster. It is also desired to call attention to the fact that the skin is excluded from the field of operation with towels tacked around the wound. The patient is allowed to get up as soon as desired.

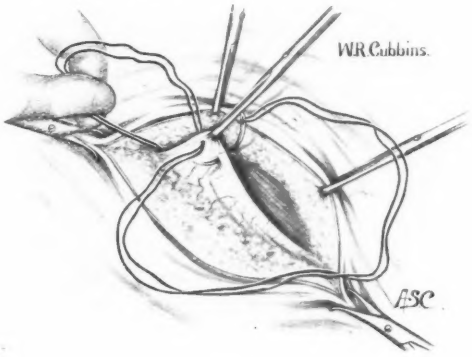


Fig. 5.

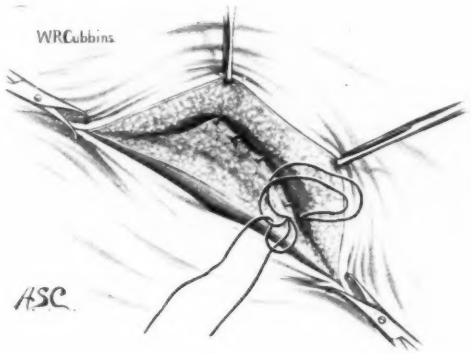


Fig. 6.

AN IMPROVED METHOD OF APPROACHING THE LOWER ABDOMEN

By GEORGE W. ROBERTS, Ph. B., M. D., New York City, New York

INCISION of the abdominal wall in or near the median line and in a direction parallel to the long axis of the body has become such a universal custom in performing laparatomy for pelvic disease that no one seems to raise a question as to the merits of another method. That a median incision is a straight cut made in a direction most convenient to the surgeon cannot be doubted; that it is quicker than any other method and requires almost no skill at all must also be conceded; it is probable that these very questionable merits were responsible for the adoption of the central incision in the early days of abdominal surgery when sections were infrequent and mortality high. Then, the surgeon considered his operation a success if the patient even lived and a veritable triumph if she was relieved of some gross lesion, the refinements of abdominal and pelvic surgery were unknown, and ventral hernia, unsightly scars, and other unpleasant results of the operation were lightly passed over.

While accumulating experience has brought improvement in many surgical methods, it is probable that the well known inertia of the profession and its slavery to dogma are responsible for the cold reception with which the work of Pfanensteil was received.

McBurney introduced the anatomic principle in his appendical incision but it seems to have been accepted only because the results were so universally bad by the old incision, especially in the pus cases.

Prior to the summer of 1906 I had always used the central incision in approaching the lower abdomen and was aware of only a few cases of ventral hernia following my work; however, I had operated many times for the cure of ventral hernia and at about this time the loss of two patients following this operation directed my attention to the principles involved in making and closing lower abdominal incisions.

Technique having improved, our dressings had grown progressively lighter till I entertained doubts as to the necessity of any dressings at all upon the clean wounds deliberately made by the surgeon.

Thus began the development of a method of approaching the lower abdominal cavity and of treating the wound and the patient during the period of healing which has proven so satisfactory in a series of some three hundred cases that I feel at liberty to place it before the profession and at the same time analyze its merits as compared with the commonly used central incision.

The central incision, when critically viewed, has many disadvantages, some of which are manifest during the operation itself, others during the healing process and in fact during the entire life of the patient. (1) While the incision has a low limit which is slightly above the pubes, it can be extended only in the upward direction, i. e., further and further away from the pelvis where room is most frequently needed; in order to gain one fourth inch better access to the side of the pelvis it requires one inch at least of extension of the incision upward. (2) If it becomes necessary, as it usually does, to use retractors, they must be used with considerable force, since the inelasticity of the anterior rectus sheath necessitates pulling the whole mass of the abdominal wall to the side; this results in great and long continued traumatism and often in pressure damage ending in necrosis and infection. (3) Worst of all, the central incision renders the abdominal wall weak at a place and time when greatest strength is needed. The one structure upon which we must depend for strength of the abdominal wall during the hours of nausea, the days of healing, and the years of life succeeding an abdominal operation, is the anterior rectus sheath, or as some are accustomed to call it, the "fascia." Now this fascia is made up in its lower fourth of the aponeurotic or tendinous fibers of the external oblique, the internal oblique, and the transversalis muscles, and when intact it forms such a strong, thick, flat tendon that its rupture or the separation of its fibers is only the rarest accident, usually caused by a powerful direct blow.

A central abdominal incision cuts this broad tendon at right angles; when sutures are placed they must be of heavy strong catgut and reinforced by silkworm gut or other "stay" sutures; the pull upon each individual stitch and upon the suture line as a whole is enormous, because the resultant force exerted by the three pairs of lateral muscles, at a time of vomiting or straining for instance, is nearly at right angles to the line of incision. The tendency to pressure anæmia is also great because this same force is constantly acting in a less degree, due to the

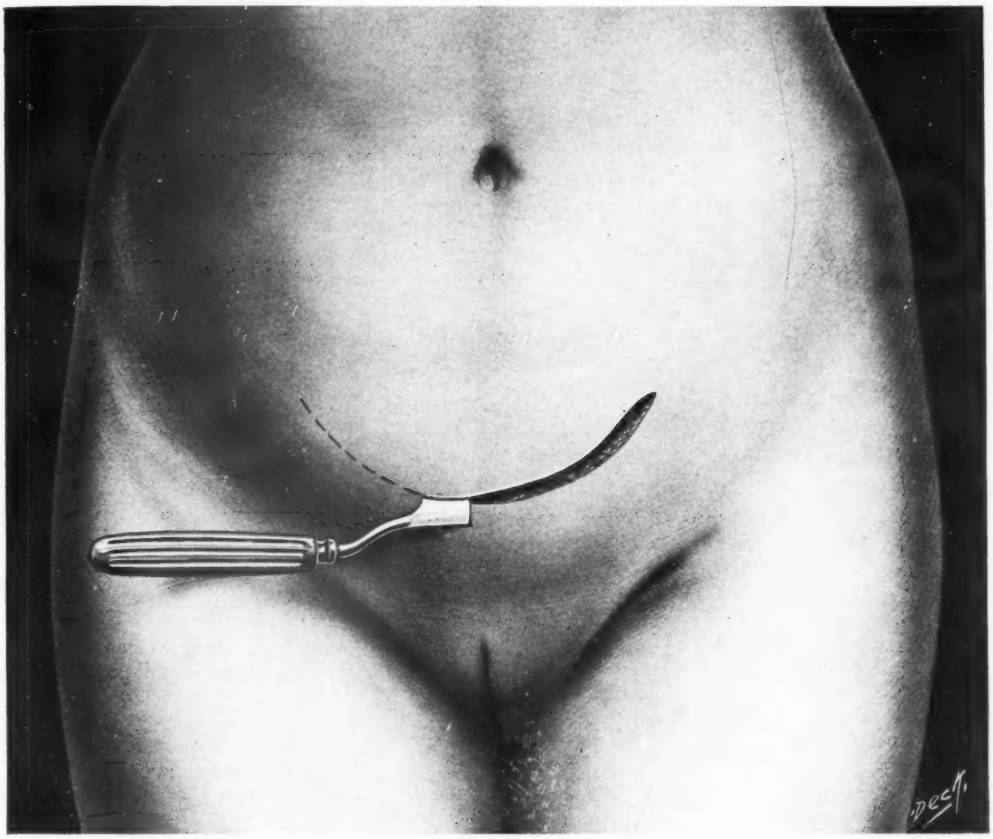


Fig. 1. Roberts' skin graft knife held nearly flat upon skin making skin graft incision.

tonic contraction of the muscles and to its result, the intra-abdominal pressure.

However much is said to the contrary, ventral hernia is not a thing of the past. Hundreds of operations are necessitated for its cure every year and these operations are neither simple nor do they lack an appreciable mortality. It is true that a more careful technique, more accurate approximation of homologous structures, and the development of better suture materials have lessened the likelihood of hernia, but there still occur far more cases than operators like to admit and more in each surgeon's practice than he knows about because he is likely to lose contact with such a large proportion of his cases.

The central incision as ordinarily executed has many other disadvantages of a more or less annoying nature; if infection occurs or if drainage is necessary the danger of ventral hernia is increased a hundred fold. Transcutaneous sutures, superficial and deep, frequently carry germs to deeper structures, resulting in annoying stitch hole abscesses. The superficial dressing fastened on by adhesive plaster or bandages or more commonly by both is annoying and its removal painful, and moreover it serves to hide the wound from the surgeon's view.

The method which I have developed, although considerably modified is based upon the principle promulgated by Pfanensteil and is executed as follows:

I use a keen bladed, hollow ground knife with offset handle to make a semicircular skin graft incision four or five inches in length and so placed

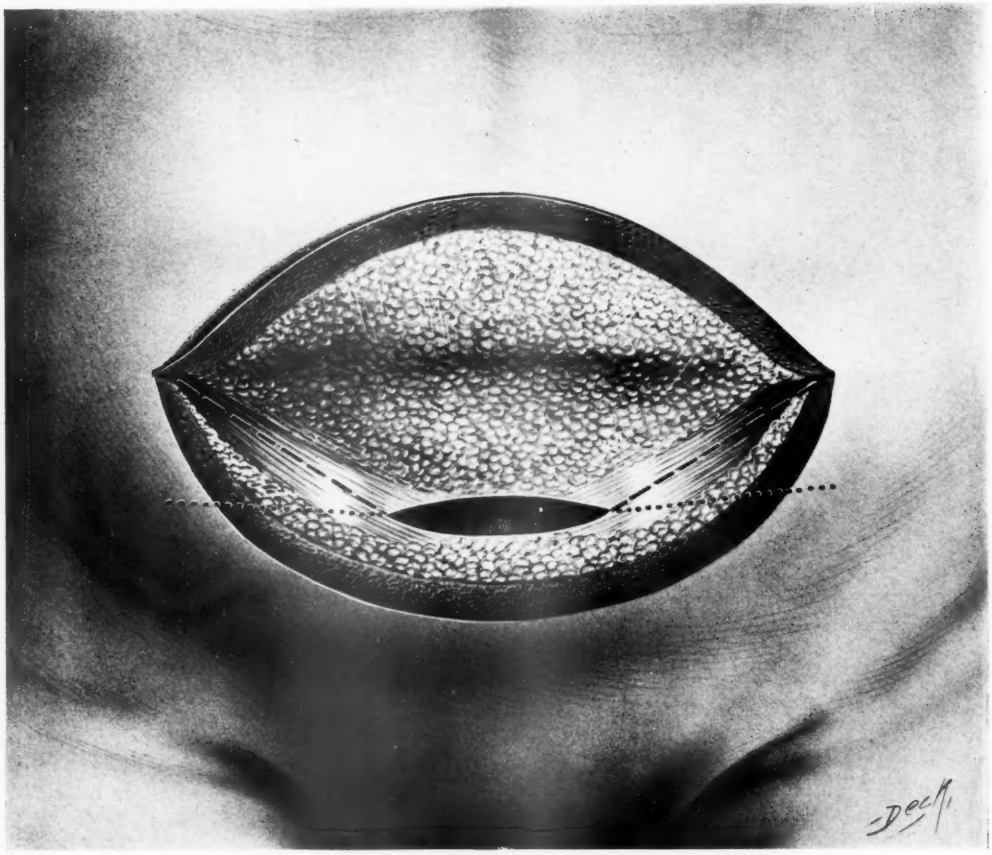


Fig. 2. Tendon of external oblique exposed and incised from one linea semilunaris to the other. Dotted lines show direction of incision in external and internal obliques.

that it is all or nearly all below the pubic hair line and the center of its convexity comes just above the pubic symphysis. (Fig. 1.) In making this incision the knife is held at such a slight angle to the skin that it cuts a graft from one-fourth to one-third of an inch long before it reaches the subcutaneous tissue; at this point the skin graft knife is laid aside, the graft is wiped back, and the incision continued in the usual manner with a scalpel down to the fascia of the external oblique which is bared by gauze wiping.

In traversing the fat layer the incision is carried somewhat upward till it reaches the external oblique about one and a half inches above the pubic border; the anterior rectus sheath (conjoined fibers of the tendon of the external and internal oblique and transversalis) is cut from linea semilunaris to linea semilunaris exposing the perpendicular fibers of the rectus abdominis on each side as well as those of the two pyramidales, when these little muscles are present. (Fig. 2.) From the ends of this incision (which is usually about two and a half inches long) an incision is made which *splits* the fibers of the external oblique upward and outward for two or three inches and also a similar incision which *splits* the fibers of the internal oblique outward toward the pelvic wall in a direction which carries the incision under the lower portion of the external oblique — the transversalis being hardly distinguishable in this location. (Fig. 3.)

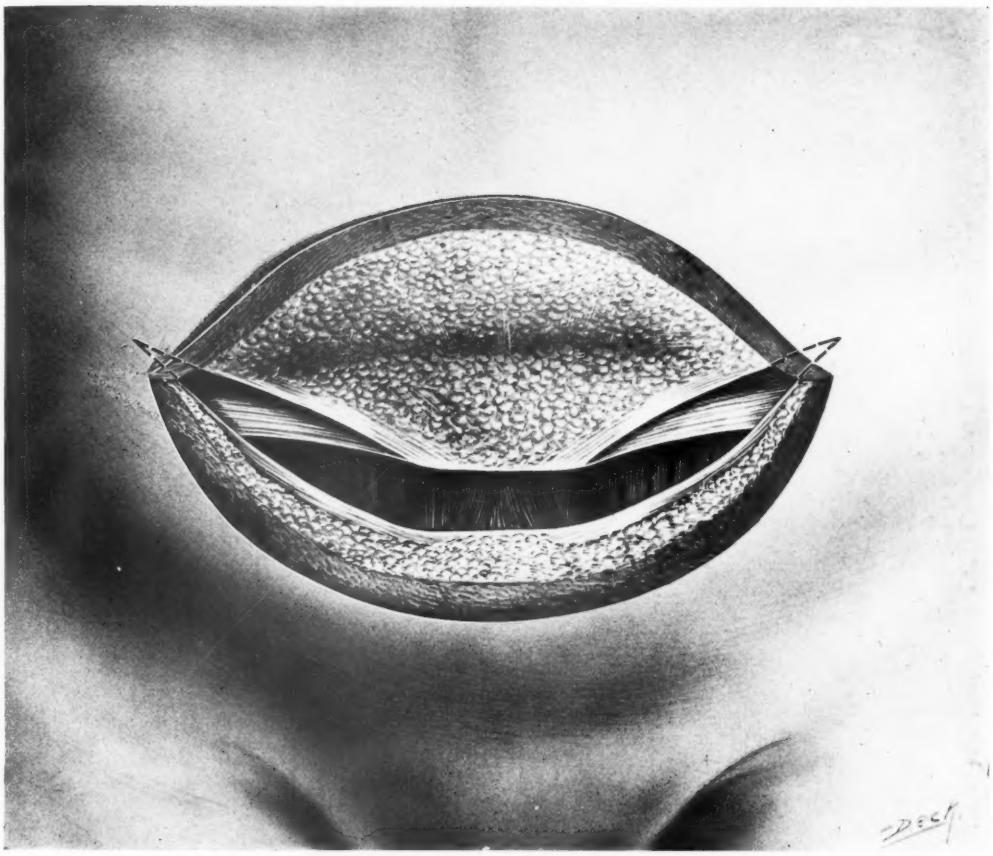


Fig. 3. Incision complete as far as rectus muscle; flap retracting somewhat.

Now, this flap lying anterior to the recti is lifted up and the fibers dipping down between the recti are cut as the lifting process goes onward till the recti are bared four or more inches of their length. (Fig. 4.) The recti are now separated, the right rectus being slid from under the right pyramidalis and the peritoneum opened longitudinally and in the usual manner.

We wear sterile rubber gloves, linen sleeves, and gauze face masks, and from the time the incision reaches the abdominal fat the entire skin surface is covered with moist gauze so that only the wound itself is exposed, and throughout the operation the most careful and consistent aseptic technique is maintained.

When the intra-abdominal procedure has been completed the wound is closed throughout with No. 1 plain iodine catgut (Bartlett process) the sutures being introduced as follows: (1) One continuous suture enters the border of the left rectus or pyramidalis at the lower limit of its separation and then passes back and forth through the peritoneal borders in such a manner that these edges are turned out and broad peritoneal surfaces are approximated: when this line of suture has reached the upper limit of the peritoneal incision the last stitch goes up through the border of the right rectus and begins a continuous suture of the rectus borders, consisting of not more than four stitches terminating at the lower end of the incision where the thread is tied to the other end of the peritoneal suture which has meantime

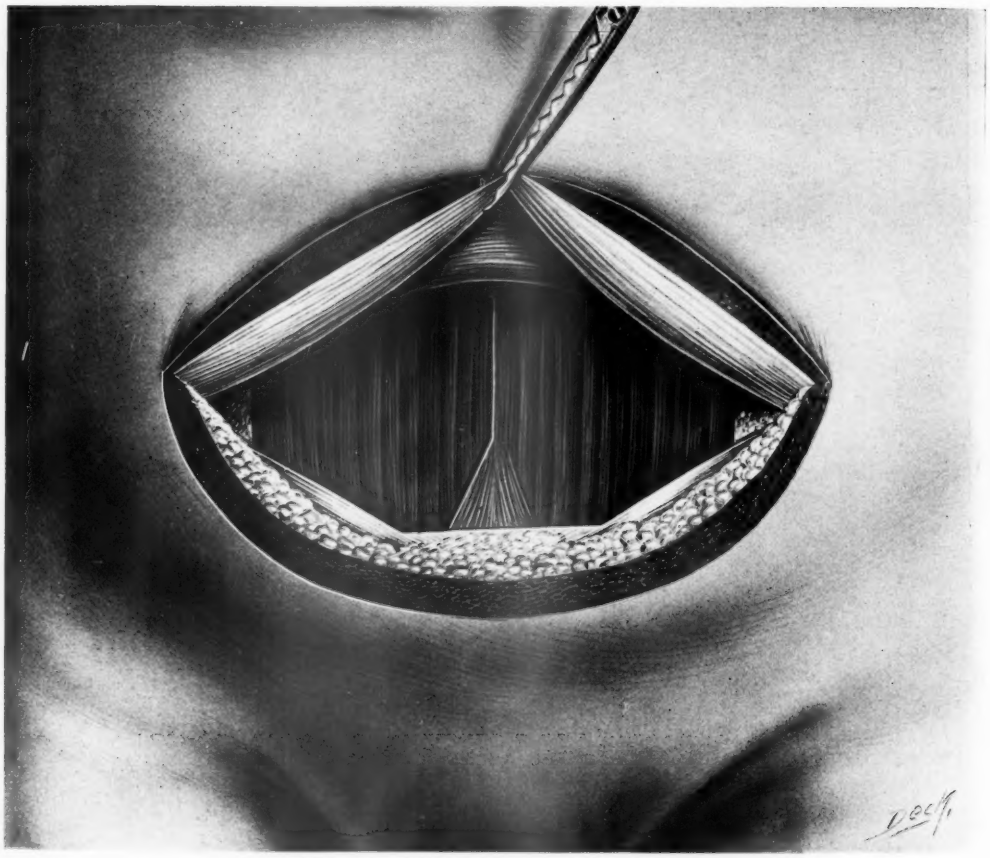


Fig. 4. Recti exposed, and line of their separation indicated by black line.

been held by a forcep. (Fig. 5.) This double line of very fine catgut, having only a single square knot holds in adequate approximation the peritoneal borders and at the same time maintains such a position of the recti that they are bound to heal to their anterior sheath without separation no matter how vigorously the patient may cough or vomit. (2) Another long strand of No. 1 catgut, having a forcep attached to its end, approximates the separated fibers of the oblique abdominal muscles as follows: on the patient's left side it pierces the lower edge of the external oblique and then of the internal oblique and transversalis (about an inch lower down and underneath the external oblique); it now as an over and over stitch approximates the edges of the internal oblique and transversalis as far as the left linea semilunaris (only two or three stitches) when it begins to involve all muscles in front of the recti as far as the right linea semilunaris. To the right of the right semilunaris the suture again approximates the separated fibers of the internal oblique and transversalis only, but the last stitch goes up to the upper border of the external oblique at the limit of the incision on the right where it begins to return to the point of starting — involving external oblique only as far as the right semilunaris. (Fig. 6.) Then in front of the recti the stitches are placed between those of the earlier portion of the suture and on the left side closing the external oblique and being tied to the beginning of the strand.

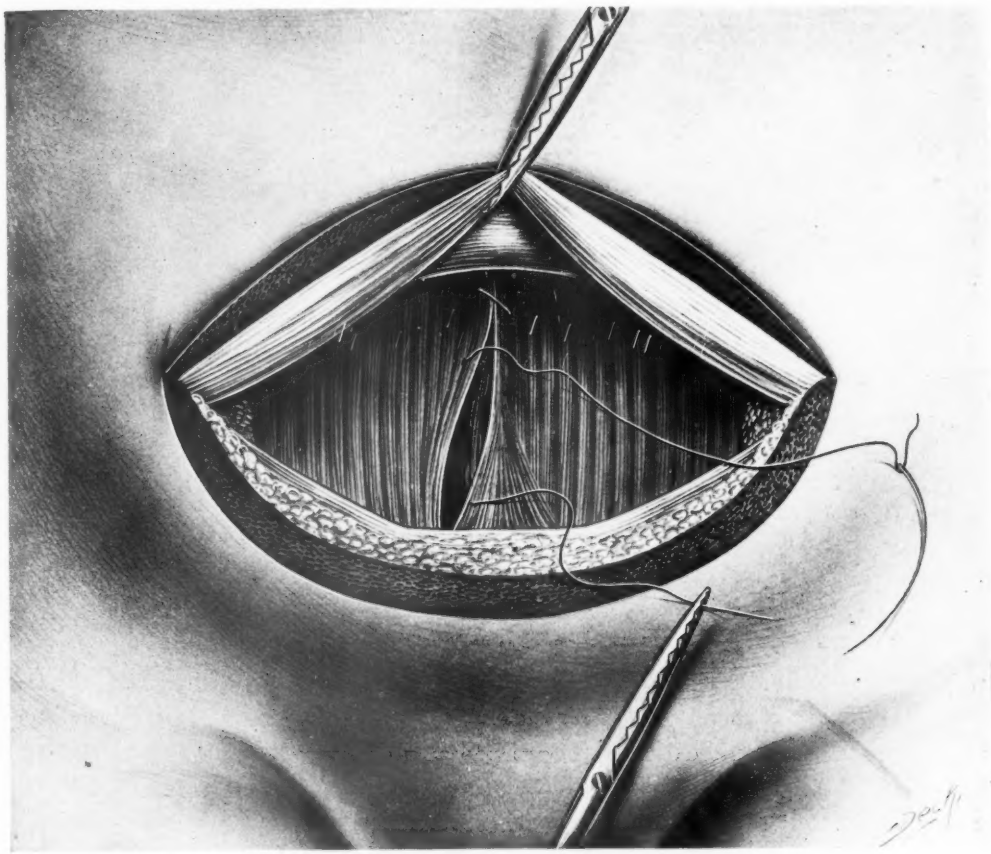


Fig. 5. First suture coapting peritoneal surfaces and rectus borders nearly completed.

This second strand has now approximated the separated fibers of the three oblique muscles in lines absolutely parallel with their fibers in such a manner that there is no appreciable strain upon the catgut. (3) A single strand of the same sized catgut now closes the skin wound as a subcutaneous, not subcuticular, stitch, leaving the original skin graft or flap unattached as it was when the skin graft knife was laid aside. The fat layer is allowed to take care of itself, our only precaution being to accomplish perfect hemostasis and to squeeze the air out of the deeper portions of the wound before the subcutaneous suture is tied.

The skin flap is now fastened in place by means of strips of sterile court plaster three-fourths of an inch wide and one and a half inches long, which approximate the edges with perfect accuracy leaving uncovered interspaces of about one-fourth inch. (Figs. 7 and 8.)

These strips of court plaster complete the dressing, a sterile towel is placed over the wound while the patient is being taken to her bed but the incision is then exposed to the air for an hour or so till it is thoroughly dry, when the abdomen is treated as though there were no incision except that it is under no circumstances washed. If a little blood or serum oozes from the wound between the plaster strips it is absorbed by a piece of sterile gauze and the exposure is continued; drying of the wound resulting as it does in the formation of a delicate crust of dried blood or serum seems to be the keynote in this, nature's perfect method in healing. The patient begins

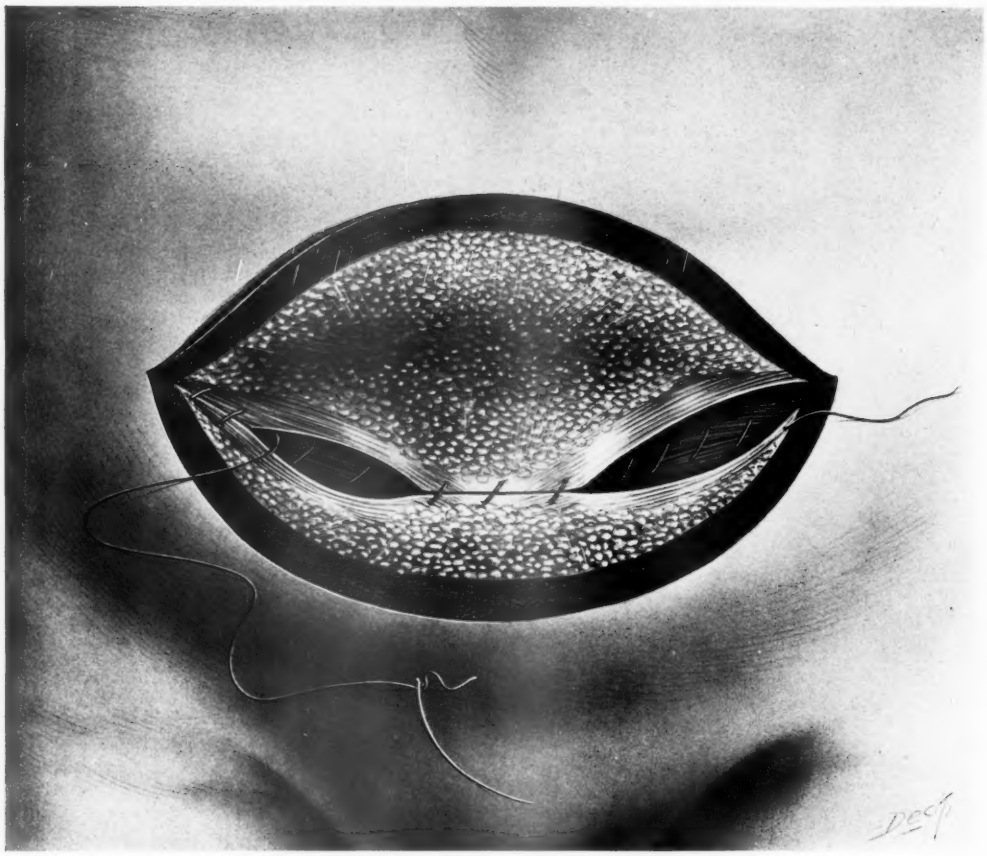


Fig. 6. Second suture, coapting edges of split oblique muscles, separately at the sides but together in front of the recti.

to sit up as soon as she chooses, and the court plaster strips are removed on the fifth day.

Between April 19, 1906, and June 24, 1911, we operated 301 cases by this method. The operations are classified as follows:

Exploratory laparotomy, 20.

Operations for benign pelvic tumor, displacements, or chronic pelvic disease, exclusive of sepsis, tuberculosis, and cancer — in which the pelvic organs were not removed, 106.

Supravaginal salpingo-oöphoro-hysterectomy, 149.

Pyosalpinx or otherwise septic or tubercular cases, 31.

Hysterectomy for uterine cancer, 10.

Salpingo-oöphoro-hysterectomy for tubercular pelvic diseases, 3.

Ectopic pregnancy, 4.

Oöphorectomy for cancer, 1.

Perforation of the bladder with general septic peritonitis from tubercular ulcer of the bladder, 1.

Cæsarean section — contracted pelvis, 1.

Other operations were executed upon the same patients as follows:

Appendectomy, 110. Plastic operations upon the vaginal outlet, 81. Operations upon the digestive tract, 2. Extra-abdominal operations, 13. Hernia, 4. Operations upon the biliary tracts through a separate incision, 12.

Two hundred and seventy were primarily clean cases, of these ten had wound infection

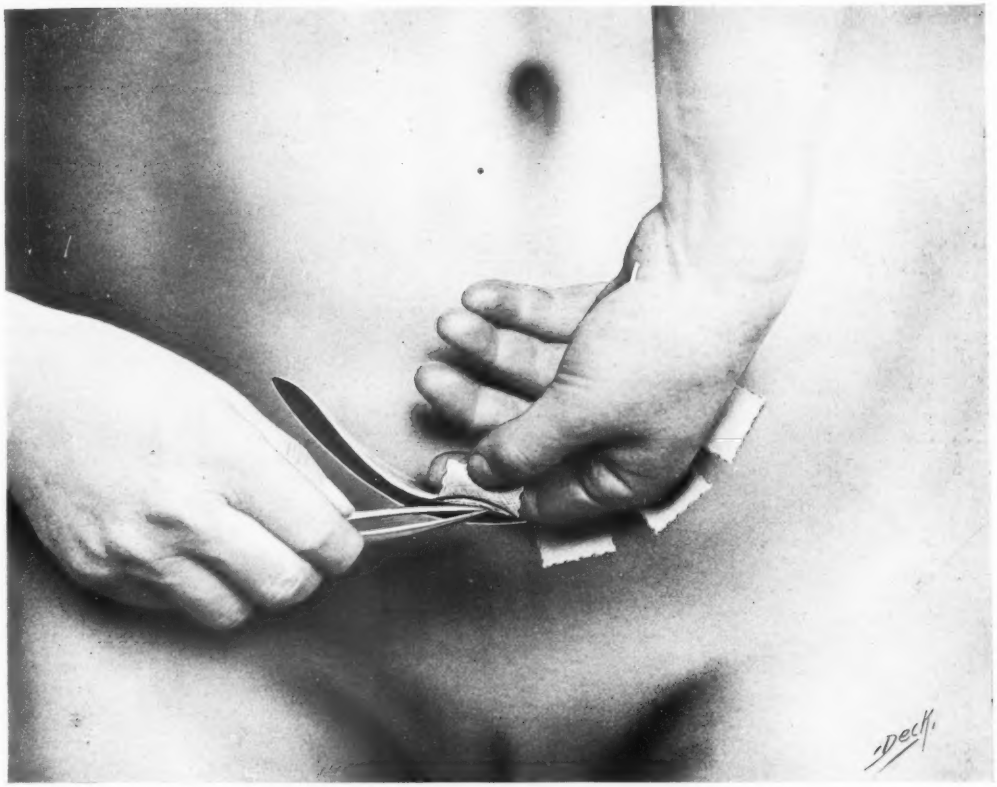


Fig. 7. Position of hands in wiping graft onto partially attached plaster strips.

3.7 per cent. Of the clean cases, three died. Mortality in clean cases, 1.11 per cent. Thirty-one were septic at the start and two died. Mortality of septic cases, 6.45 per cent. Mortality of all cases, 1.66 per cent.

CONCLUSIONS

The central abdominal incision is fundamentally wrong because it cuts across at right angles and permanently weakens the fascia (the tendon of insertion of the external and internal oblique and transversalis abdominis muscles) thus placing the suture line and the scar line under the greatest possible strain.

While the central incision is capable of indefinite extension upward this helps one but little in dealing with pelvic and lower abdominal conditions, while every inch adds to the danger of ventral hernia. Four-fifths of the pain following laparotomy by central incision is due to pull upon the stitches uniting the powerful tendon of the lateral abdominal muscles, and can be avoided by separating these fibers instead of cutting them transversely to their line of pull.

The incision here described gives ample room for all pelvic and most lower abdominal work, including Cæsarean section but excepting the removal of solid tumors over seven or eight inches in diameter. For ordinary pelvic work it gives a better approach and requires less retraction than the central incision; it gives far less pain and is less liable to suppuration because there is less strain on the stitches, practically none, and therefore the finest catgut can be used. The scar is in most cases invisible, ventral hernia never results even if the wound suppurates; healing is quick, the patient is up early, and never requires a belt or support of any kind.

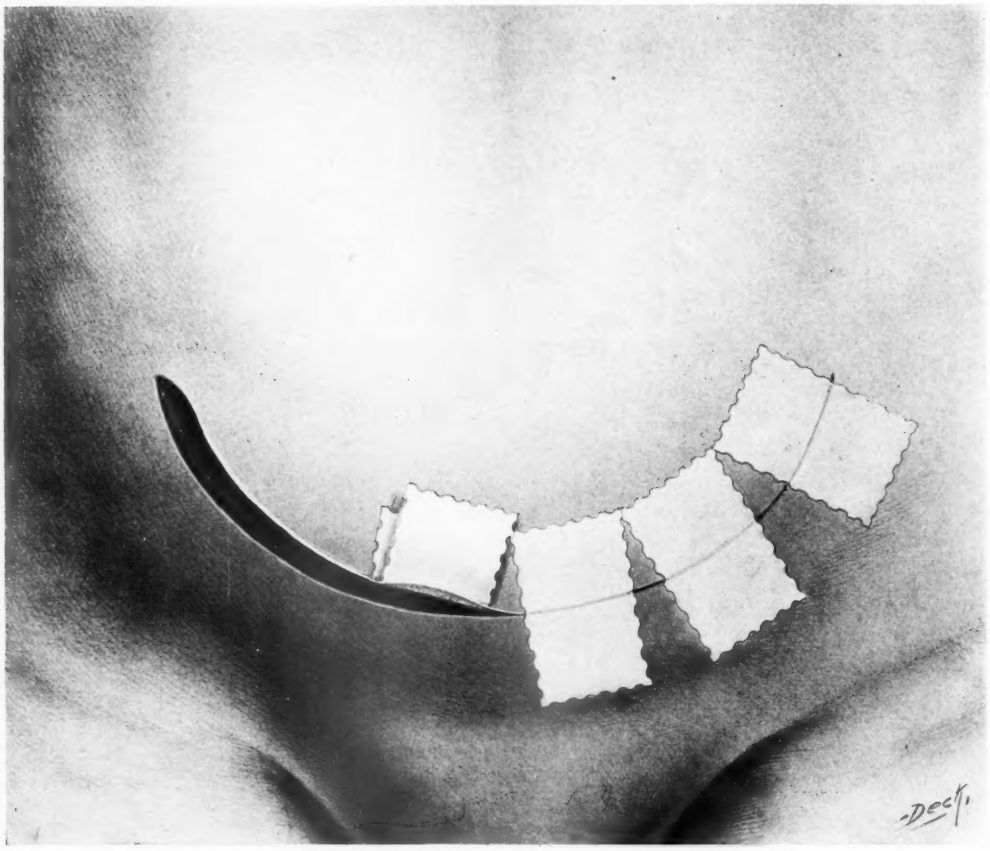


Fig. 8. Appearance of incision, nearly closed.

The use of gauze and cotton dressings, held in place by unpleasant and often painful strips of adhesive plaster, is avoided and the wound is open to inspection at all times, being covered for the most part by transparent isinglass plaster strips and the interspaces being sealed by nature's method, dried serum and blood.

Drainage, when necessary, is through a stab wound in the center of the base of the flap.

The disadvantages of this method are that it requires a few more minutes (not over five) to execute and repair, that it is necessary to grasp a few more bleeding points, and that it requires a little practice in order to execute it adroitly.

A CASE OF BRAIN TUMOR WITH SECOND OPERATION

By JAMES R. JUDD, M. D., Honolulu, Hawaii

THE question of the performance of a second operation in a case of brain tumor does not often arise. An operation for the removal of a brain tumor is successful, results fatally, or is abandoned on account of the inoperability of the case. Therefore when a surgeon is confronted with a condition rendering the question of a second operation of great importance, one looks in vain for help from the text-books of general surgery.

The patient was a lawyer, 40 years of age, a man of unusual intelligence and he was able to describe in detail his subjective symptoms.

Family history. Negative as to any malignant growths.

Past medical history. At six years of age he suffered from "gastric fever" and since then has had a weak stomach. He has used lavage for catarrh of the stomach for past five years. Two years ago he had an attack of renal colic and passed a small calculus. He has been a cigarette smoker for twenty-five years and for past twenty years has used alcohol, to excess at times. There is no history of luetic infection.

Present illness. This dates back seven years. The patient suddenly awoke one night with a sensation of choking. His jaw was drawn towards the left side and he felt a tingling sensation along the left side of the nose. Similar attacks continued at irregular intervals sometimes on succeeding days and at times there would be an interval of a month between them. During some of the seizures the jaws would lock and he would bite his tongue or cheek. The duration of the attacks was estimated at from one to two minutes. Physical or mental exertion would be apt to bring on the seizures. He never lost consciousness. The patient was able to foretell the attack by an aura, which was always present, and he then prepared himself by lying down. The usual feeling in the proportion of about three to one was "a peculiar sinking feeling in the chest;" at other times there would be a tingling sensation along the left side of the nose. These attacks have continued up to the present time but have been somewhat controlled by large doses of bromides.

Psychic changes. For the past year his memory has been defective and it has been difficult for him to concentrate his attention on his work. He has had periods of drowsiness and has slept much in the daytime. There have been emotional disturbances as feelings of depression and crying.

For the past year he has noticed some tenderness on the right side of his head, also a "continuous tight feeling." The headache during the past two months has been very severe. Vertigo was present when walking in the dark and he staggered considerably. There has been no vomiting. Pains and sensibilities have been present as tingling in the fingers and wrist of the left hand during the afore described attacks. At times the thumb and three fingers would feel numb for a period of a few minutes to several hours independently of the convulsive seizures.

About a year ago he began to drop things that he was holding in his left hand and also developed a limp, favoring his left leg. For the past two years he has been unable to move his tongue to the left side of his mouth. He also could not feel the teeth of the lower left side with his tongue. There has been a drooping of the left side of the face for past year and a half.

Mesial view of tumor.

Four years ago he suddenly noticed that on closing his right eye he could see with his left eye objects in the upper part of the field of vision and not in the lower field. This condition continued for a few weeks and then appeared in the right eye. The condition was only noticed when one eye at a time was opened.

A course of mixed treatment had been followed out with apparently some temporary improvement.

Physical examination. Fairly well nourished adult. The face shows a drooping of the muscles of the left side and the muscles of the right side move more in speaking. Palate reflex is less acute on left side. Sensation is impaired over the left side of the face. On percussion over the right temperoparietal region, a tender spot is located about 5 cm. above the external auditory meatus. The percussion note is higher pitched. No difference in temperature is noted. No disturbances in hearing, taste, or smell. There is a mild grade of aphemia present. The left arm and hand show some atrophy, the thenar muscles especially. Reflexes are normal. Sensation is diminished. Astereognous is not present. Left knee jerk greater than the right. No atrophy or impairment of sensation of leg. No Babinski or Oppenheim reflexes.

Examination of eyes by Dr. W. G. Rogers and Dr. E. W. Alexander. ODV, $\frac{6}{5}$. OSV, $\frac{6}{5}$. Fields contracted for form but especially for colors, with apparent transposition of red and green. Pupils equal and react. Tension normal. Conjunctiva fairly clear. Media clear. Double optic neuritis. OS, seems older and more marked. OD, disc: the vessels are defined, though blurred, and fairly straight. No hæmorrhage or exudate. OS, disc: veins defined, but blurred, larger and more tortuous than OD. Arteries disappear at edge of disc. One hæmorrhage small

Photograph of patient taken ten days after operation.

and superficial above disc. Considerable dirty white exudate around disc. Two symmetrical roundish spots of choroidal atrophy (?) in the line of the choroidal fissure, with fair amount of pigmentation of the edges. Condition of accommodation good.

The urinalysis was negative. Pulse, 76–80.

A diagnosis of cerebral tumor involving right motor area was made and operation advised and accepted.

Operation. Anæsthetic chloroform preceded by hypodermic of morphine grain one-fourth. Craniotomy by large Wagner flap, using trephine, Gigli saw, Dahlgren and Montenovesi forceps as recommended by Cushing in Keen's Surgery, Vol. III. The parietal bone showed a thickened area about the size of a dollar corresponding to the tender point. After turning down the dural flap which was quite adherent, a tumor was found pressing on the right temperoparietal lobe. A few vessels running between the pia and margin of the tumor were ligated and divided and the tumor gradually enucleated using cotton packing to control hæmorrhage. The cavity left by the removal of the tumor was filled with hot salt solution and the dural flap sutured with fine, plain catgut. The scalp and aponeurosis were closed leaving a small cigarette drain leading out through the posterior trephine opening.

The weight of the tumor was 86 grams, length 8 cm., width 6 cm., circumference 16 cm. Microscopic examination endothelioma.

Subsequent history. There was considerable shock following the operation from which however, the patient rallied in a few hours. Vomiting was severe and persisted for three days in spite of lavage. There was profuse, thin, serous drainage. The drain was shortened on the second day and removed on the third day. The wound healed by primary union and the stitches were removed on the fifth day. At that time it was noticed that there was some bulging of the flap.

On the third day after the operation the patient noticed that he could see the electric light on the ceiling of his room with his left eye which before the operation he was unable to do. Sensation returned to the left side of his tongue so that he could feel his teeth. The headache entirely disappeared, there was normal convalescence and the patient was much pleased at his improvement.

On the fourteenth day while the patient was up and about he began to notice a disability of his left arm and leg. The wound was examined and more bulging was apparent especially along the anterior margin. From that time on there was a slow but steady development of left arm and leg paralysis. The patient could walk with assistance but the left arm became quite helpless. The margin of the scalp incision gradually separated and a small fungus appeared at the anterior trephine opening. The whole area involved in the bone flap bulged and the shelving edges of the superior margin of the bone division were no longer in apposition. There were no evidences of infection and the patient felt well except for the weakness of his arm and leg. Vision improved steadily and there was no more headache.

The patient was very anxious to have something done if possible to relieve him of his paralysis. Here then was the problem. Should the case be reoperated on with the theory of finding either an organizing blood clot occupying the cavity left by the removal of the tumor or some other lesion, or should it be left to nature? It seemed important that if there was anything to be done it should be undertaken before permanent degenerative changes had taken place. An exploration was decided on and performed five weeks after the first operation.

Second operation. The bone flap, which had not united, was turned down. The dura was thickened and adherent to the cortex and the entire exposed intercranial area was bulging. The dura was incised along the anterior line of bone incision and a finger introduced showed that the cavity formerly occupied by the tumor was not

entirely obliterated. As there was apparently nothing to be done, the wound was closed as well as possible.

This apparently simple procedure resulted disastrously. The operation was followed by severe vomiting as after the first operation in spite of all measures to control it. A temperature developed on the third day and continued until the end seven weeks later. Mental torpor alternating with delirium began to develop and loss of sphincteric control appeared. The patient sank into a typhoid state and a terminal pneumonia ended his life ninety days after the removal of the tumor and fifty-four days after the second operation.

SUMMARY

1. Such classical symptoms as vomiting and slow pulse were absent in this case.

2. The paralysis coming on two weeks after the removal of the tumor was a late and unusual complication and hard to explain.

3. The cavity left by the removal of the tumor was not obliterated forthwith by the expansion of the brain.

4. The presence of the fungus, however small, was a counter indication to exploration on account of the risk of infection.

5. The dural flap should not have been sutured with plain catgut, as violent vomiting disturbed the suture line before union was established.

PHARYNGEAL ANÆSTHESIA

Advantages Offered by the Method, Description of New Apparatus, and a Report of Cases

By HERBERT K. THOMS, M. D., New London, Connecticut

From the Surgical Laboratory of Yale University

IN operations upon the face, head, and neck, anæsthesia by the usual method presents many disadvantages. Not only is there much interference with the freedom of the operator on the part of the anæsthetist, but also the maintenance of a strict asepsis is often very difficult.

Of the methods suggested to obviate these conditions, the administration of oxygen or air saturated with ether vapor by a tube passing through the nostril to the naso-pharynx, gives the operator complete command of the head, the possibility of a complete asepsis, and anæsthesia which is so regular as to be almost automatic.

Some time ago, at the suggestion of Dr. J. M. Flint, I undertook a series of experiments with rectal and pharyngeal anæsthesia, the results of which are published in another place.[1] In this paper, I described an apparatus which could be used for either method. Further experience with both methods and the apparatus revealed that the latter could be considerably simplified, and that, of the former, the pharyngeal method practically displaces rectal anæsthesia in all cases, except perhaps those with serious pulmonary lesions or those in which operations directly in the nose or mouth are to be performed.

Accordingly it is my desire to present a simplified form of apparatus and to call attention again to the many advantages of the pharyngeal method. So far as I am aware, Souchon[2] was the first to devise an effective apparatus for pharyngeal anæsthesia designed to avoid the interruption of the anæsthesia in face and mouth operations and to prevent the insufflation of the anæsthetic fluid into the pharynx, which had been the drawback to previous attempts to utilize the pharyngeal route. His apparatus consisted of an ether reservoir through which an air current was driven by means of a hand bulb into a pharyngeal catheter. In a similar way anæsthesia has been induced in Hartley's clinic by a nasal tube and a simple form of ether bottle and a rubber hand bulb to produce the pressure. Likewise Crile[3] has used a method of administration by double nasal tubes which connect with a gauze covered funnel upon which ether is dropped.

In anæsthesia by the pharyngeal method, the same factors governing ordinary inhalation narcosis are present. An exception to this is found in the fact that the secretion of saliva is greatly lessened in pharyngeal anæsthesia. This is due to the passage of the ether-laden oxygen (or air) directly into the posterior naso-pharynx, thus

[1] Yale Med. Jour., May, 1910.

[2] Souchon. Medical News, 1895.

[3] Keen's Surgery, vol. iii, p. 329, 1908.

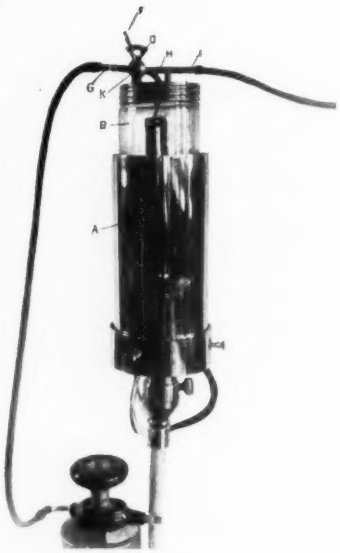


Fig. 1. Apparatus for pharyngeal anæsthesia showing connection to oxygen tank.

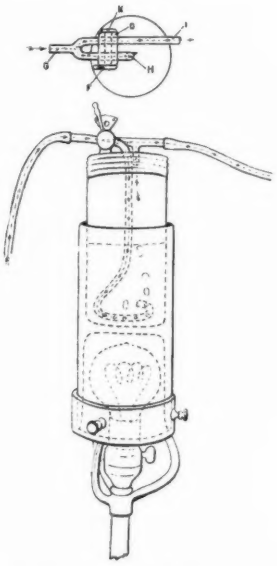


Fig. 2. Projection drawing of the apparatus showing the method of heating and the direction of the oxygen current with and without ether.

eliminating much of the irritation of the buccal mucous membrane and consequent stimulation of the salivary glands.

This probably explains the comparative absence of postoperative vomiting in the cases here reported, as the swallowing of ether laden saliva, and its irritant effect upon the mucosa of the stomach, is looked upon as the most frequent cause of the nausea which so often follows the administration of ether by the ordinary cone method.

DESCRIPTION OF APPARATUS

In the following description the reader is referred to Figs. 1 and 2 of the accompanying illustrations. Letter A represents a water bath containing the ether chamber (B). This is heated by an electric bulb shown at Fig. 2. On the top of the ether chamber is mounted a valve (D) by means of which any desired saturation of oxygen with ether vapor can be obtained without changing the pressure of the current. This is accomplished in the following way; when the lever (F) is placed at the left of the indicator, the course of the current is, from the oxygen tank (L) through one arm of the Y-tube (G), through the valve down into the ether chamber by means of a spiral tube (H).

This spiral (see Fig. 2) ends in a series of graduated holes so the current is forced up through the ether by means of the outlet tube (I) and is conveyed by a rubber tube to the patient. Thus it will be seen that in taking this course, the oxygen becomes heavily saturated with ether vapor. However, when the lever is placed at the right of the indicator, the oxygen takes a new course. Instead of entering the ether chamber after leaving the valve, it is shunted directly across to the outlet tube by way of tube (I) Figs. 1 and 2.

Of course it is obvious that the oxygen in this new course reaches the patient unsaturated with ether. The oxygen then in coming from the supply tank can reach the patient by two routes, the choice of which is determined by the valve (D). In addition to this, this valve is so arranged that the oxygen can not only take either of the above routes, but also any fraction of either route. This then, being possible, the patient can receive any amount of ether vapor without changing the volume of the current.

The way in which this latter is accomplished can be best shown by means of the drawing (Fig. 2). The essential part of the valve is the plunger (K). This plunger is perforated by two holes which are set at such an angle with one another that when the lever is placed at the left of the indicator the anterior hole allows the full current

to pass through the ether chamber. When the lever is moved toward the other side, this anterior hole is gradually shut off and the posterior hole brought into play, thus opening up the avenue for the oxygen to pass directly to the outlet tube (I). It will be seen that the saturation, and in fact, the whole anæsthesia can be controlled by this one lever.

A thermometer is placed in the water bath to regulate the temperature of that body. The electric bulb is controlled by a switch placed underneath the light. A window is placed in the bottom of the water bath which allows the light to shine through the ether, thus enabling the anæsthetist to note the amount of bubbling through the ether. The whole apparatus is mounted upon an iron stand and being very light, can be moved to any part of the operating room.

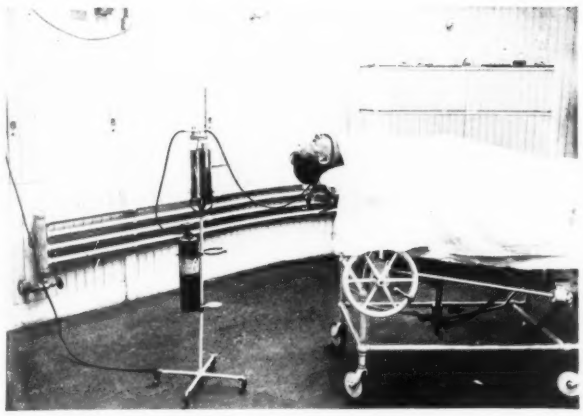


Fig. 3. Use of the method by using the apparatus for operations on the face and neck.

ADMINISTRATION

The patient is first anæsthetized by the usual method. As soon as narcosis is complete the change is readily made from the regular cone method to the pharyngeal method. A soft rubber catheter is passed through the nares into the naso-pharynx. This is held in place by a small strip of adhesive, either to the upper lip or to one side of the face. This catheter is attached by rubber tubing to the outlet tube of the ether chamber. The apparatus and anæsthetist are placed out of the surgeon's way, some distance from the field of operation, so that free control of the head is assured.

In operations upon the neck and thorax the most desirable position for the apparatus and anæsthetist is shown in figure 3 of the accompanying illustrations. In cranial operations the apparatus and anæsthetist are placed at the patient's wrist. In this position the pulse can be followed easily and the respirations noted either by inspection or palpation of the chest. The most desirable position for the apparatus in operations upon the back is shown at figure 4.

The position having been decided upon, the anæsthetist begins the anæsthesia by the pharyngeal route, controlling the narcosis by means of the lever in front of the indicator. By this method the anæsthesia becomes very simple and effective, and with little experience can be made to be practically automatic. In the following cases there has been no tendency for the tongue to fall back into the mouth, but should this occur it can be readily placed under control by passing a silk stitch through the tip of the tongue. Soreness or other untoward effects have never been noticed to follow this procedure.

REPORT OF CASES

The following fifty-four cases extending over a period of nine months were taken from the surgical service at the New Haven Hospital:

Thyroidectomy	4
Extirpation, cervical glands	21
Enucleation of eye	5
Double amputation (arms)	1
Intracranial operations	7
Herniotomy	2
Actinomycosis (jaw)	1
Necrosis (jaw)	2
Endothelioma (jaw)	1
Spinal dislocation	1
Laryngectomy	1
Epithelioma (lip)	2
Sarcoma (maxilla)	1
Mastoid operations	3
Removal of bullet (back)	1
Operation for ptosis	1
Epithelioma (eyelid)	1
Cholecystomy	1

In all the foregoing cases, narcosis was first induced by the regular drop method, the change being made as soon as the patient was well under. In no case was there vomiting or other postoperative sequelæ referable to the anæsthesia. The

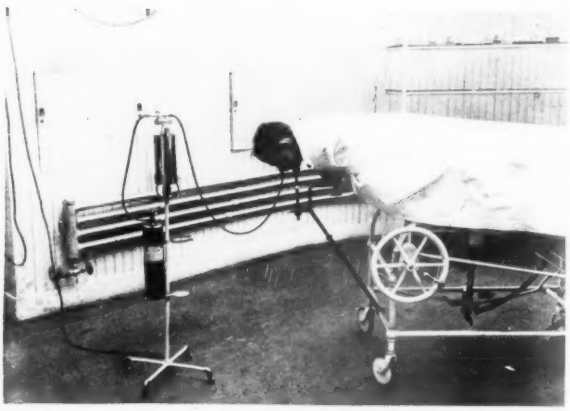


Fig. 4. Arrangement of the apparatus with patient in the laminectomy position.

charts show the pulse and respiration to be even throughout. The average amount of ether used in the series was seventy-five grams per hour. This figure is about one-half that used for the same length of time in the drop method. This saving in the amount of ether is due to the fact that in the drop method a considerable quantity of ether evaporates from the cone.

This saving also offsets to some extent the cost of the oxygen used. Oxygen, however, is unnecessary and air from a water pump of the Lautenschlager type could be substituted; the only expense being of course the initial cost of the pump.

A study of the foregoing cases reveals at once that so far as the anæsthetic is concerned, it is fully as good as the open drop method. When its additional advantages, such as the removal of the anæsthetist from the field of operation, the possibility of a complete asepsis and especially the absence of postoperative nausea are considered, it becomes at once the anæsthesia of choice in all operations upon the head, neck, upper thorax, and back.

It is extremely simple to apply, and the apparatus makes it possible to give a much more accurate dosage than is possible by the open drop method. The number of cases reported here although small are varied enough in their various aspects to give index of the method and the apparatus. The age of the patients varies from five to fifty-nine years, some presenting complicating pulmonary lesions to render the anæsthesia more trying. Likewise the operations have varied from intracranial to intra-abdominal.

To recapitulate briefly, the apparatus possesses the following advantages:

1. Gives the operator complete control of the head in all operations of the head, neck, and upper thorax.
2. Secures the anæsthetist from working in a cramped or unnatural position.
3. Reduction of postoperative vomiting.
4. Small amount of ether used.
5. Elimination of the buccal cavity from the ether circuit.
6. Anæsthesia controlled by one lever, enabling the anæsthetist to give practically all his attention to the welfare of the patient.
7. Gives practically an automatic anæsthesia.

EDWARD MARTIN, M. D.

President-Elect, Clinical Congress of Surgeons of North America

TRANSACTIONS OF SOCIETIES

THE CLINICAL CONGRESS OF SURGEONS OF NORTH AMERICA

SECOND ANNUAL MEETING HELD IN PHILADELPHIA NOVEMBER 7 TO 16, 1911

ON Monday afternoon, November 6th, the day previous to the opening of the second annual session of the Clinical Congress of Surgeons of North America, the registration rooms of the Congress were crowded with advance visitors and several hundred were registered.

Bulletin boards, encircling a large room at headquarters, were filled with the details of the clinical work for the opening day. The name of nearly every well-known surgeon of Philadelphia was on these boards. Nearly every large hospital and medical college was scheduled to furnish its quota of rich surgical material.

At eight o'clock Tuesday morning the registration rooms were filled and each man was given a printed program of the day's work. All day long and for several days the registration force was kept busy. As men registered and received their programs and prepared their day's itinerary, they dispersed to the various hospitals and colleges. At five o'clock each day, they returned to crowd the registration rooms and receive, as the bulletins were posted, a forecast of the material for the succeeding day.

The evenings were given over to the literary programs prepared for the visitors, or, to seeking recreation, which was bountifully supplied by the opera, the concerts and theaters of the city.

The clinical work which began at eight o'clock Tuesday of the first week continued uninterruptedly until five o'clock Thursday of the second week. The amount of material exhibited by the Philadelphia clinicians was almost incredible. The clinicians worked like men inspired, and the keen appreciation of the visiting physicians no doubt did much to stimulate the interest of both clinicians and observers.

The large amphitheaters of the important hospitals throughout the city were filled by audiences of surgeons, many of them with national and international reputations, watching the work of their Philadelphia confreres. Hitherto obscure operating rooms of smaller hospitals were frequently filled to repletion with an eager crowd of surgeons who had discovered an unheralded prophet who had found his opportunity (and was making good) in the Clinical Congress.

The city was visited by fifteen hundred surgeons, but the facilities for taking care of them were so perfectly arranged by the local committee of arrangements that, with few exceptions, there was no undue crowding or inconvenience to the teachers or their observers.

THE HEADQUARTERS

The headquarters of the Congress were at the Bellevue-Stratford. The rooms assigned to the registration force and the display of bulletins and for the holding of business meetings were the Red Room, the Clover Room and the large ball room, all situated on the second or parlor floor of the hotel. These rooms were not only admirably adapted for their uses, but they furnished a setting of elegance and substantiality that will always be remembered with pleasure by all who visited them.

The registration rooms were presided over by a dozen or more young women clerks and two young local physicians, all thoroughly drilled in the necessary requirements of the situation.

SECURING MATERIAL

The general manager, with two secretaries, obtained each day telephonic, written, or verbal reports of the succeeding day's clinical doings. This was transferred to the bulletin boards as early as five o'clock each evening and a copy was placed in the hands of the printer, who furnished the daily printed bulletins by seven-thirty the following morning.

DISTRIBUTION OF TICKETS

The regular registration ticket admitted visitors to all clinics bulletined which were not marked special. Special tickets to the number required were distributed each evening at headquarters about five o'clock. These special tickets were only necessary at a few of the large clinics where the demand exceeded the capacity

of the clinic rooms, and for a few places where the capacity of the rooms was particularly small.

LITERARY EVENING PROGRAMS

The first evening meeting was held in the Egyptian Room of the John Wanamaker building. Nearly two thousand physicians and surgeons attended this meeting, which was given under the auspices of the Philadelphia County Medical Society. The President of the Society, Dr. Longenecker, presided. The preliminary formalities consisted of a brief address of welcome by Dr. Joseph K. Dixon, after which the scientific program of the evening followed, which included a symposium on Surgery of the Upper Abdomen. A paper was contributed by Dr. J. F. Binnie of Kansas City, Missouri, the discussion of which was opened by Dr. W. L. Rodman of Philadelphia. Dr. George Emerson Brewer of New York City followed with Dr. Robert G. Le Conte of Philadelphia opening the discussion on his paper. The symposium was completed by Dr. Maurice H. Richardson of Boston, Dr. John B. Deaver of Philadelphia, discussing Dr. Richardson's paper. Following this meeting, at eleven o'clock, the Philadelphia County Medical Society entertained the Congress at a reception, one of the attractions of which was an organ recital on the great organ that is one of the features of the beautiful Wanamaker Hall.

THE PRESIDENTIAL MEETING

One of the most interesting evening meetings was that held in the ball room of the Bellevue-Stratford, where the members of the Congress, more than twelve hundred in number, gathered to welcome President A. J. Ochsner of the Congress, President J. B. Murphy and President-Elect Abraham Jacobi of the American Medical Association, W. J. Mayo and Alexis Carrel, the scientific essayists of the evening.

President Ochsner received a great ovation when he was introduced by Dr. John G. Clark, the Vice-President of the Congress and Chairman of the Philadelphia Committee of Arrangements. After delivering his address, President Ochsner introduced, in turn, Dr. Murphy and Dr. Jacobi, both of whom received a cordial welcome and responded by making short speeches. The scientific papers of Drs. Mayo and Carrel were listened to with profound interest and were enthusiastically received.

A reception followed this meeting, when the members of the Congress were given an opportunity to meet the officers of the Congress and their distinguished guests of the evening.

COLLEGE OF PHYSICIANS

Under the guidance of Dr. G. E. de Schweinitz, President of the College of Physicians of Philadelphia, five scientific evening meetings were provided for the members of the Congress which were held under the direct supervision of the Academy of Surgery, the Pediatric Society of Philadelphia, the Obstetrical Society of Philadelphia and the Philadelphia Neurological Society, in the new home of the College of Physicians. Four of these meetings were held in Mitchell Hall of that institution. These sessions were perfections of detail and worth in their scientific arrangements, and the setting, in that palace of medicine, was an inspiration to every one who was fortunate enough to attend the Congress. The following distinguished surgeons furnished papers and discussions for these meetings:

Philadelphia Neurological Society.

Hugh T. Patrick, Chicago. Discussion opened by F. X. Dercum, Philadelphia.

Harvey Cushing, Baltimore. Discussion opened by S. J. Mixter, Boston.

Alfred Reginald Allen, Philadelphia. Discussion opened by Charles H. Frazier, Philadelphia.

Philadelphia Academy of Surgery.

Charles A. Mayo, Rochester, Minn. Discussion opened by Francis J. Shepherd, Montreal.

Joseph A. Blake, New York City. Discussion opened by Edward Martin, Philadelphia.

J. M. T. Finney, Baltimore. Discussion opened by Maurice Richardson, Boston.

Pediatric Society of Philadelphia.

Charles L. Scudder, Boston. Discussion opened by John B. Deaver and Edward Hodge, Philadelphia.

Charles N. Dowd, New York City. Discussion opened by Henry R. Wharton and John H. Jopson, Philadelphia.

R. Tunstall Taylor, Baltimore. Discussion opened by H. Augustus Wilson and G. G. Davis, Philadelphia.

Obstetrical Society of Philadelphia.

Edward Reynolds, Boston. Discussion opened by J. M. Baldy, Philadelphia.

Edwin B. Cragin, New York City. Discussion opened by E. E. Montgomery, Philadelphia.

John A. Sampson, Albany, New York. Discussion opened by John G. Clark, Philadelphia.

Combined Sections on Otology, Laryngology and Ophthalmology.

Joseph A. Bryan, Washington, D. C.
Gorham Bacon, New York City.
John E. Weeks, New York City.

THE SUCCESS OF THE CONGRESS

Before two days of the meeting had passed, there was no longer a question of its success but rather what city could duplicate the achievements of the Philadelphia surgeons.

NUMBER IN ATTENDANCE

Eight hundred and seventy surgeons, representing practically every state of the United States and every province of Canada, actually registered and paid their registration fees. Two hundred complimentary registration tickets were issued to clinicians and essayists taking part in the scientific programs. It was estimated that at least two hundred and fifty additional medical men took advantage of the invitation issued by the Congress to witness the work of the Philadelphia surgeons who did not present themselves at the registration booths and therefore cannot be counted.

THE PHILADELPHIA COMMITTEE ON ARRANGEMENTS

It is impossible to write an outline history of the Philadelphia Clinical Congress without mentioning the names of the Committee on Arrangements that worked for six long months to bring it to a successful issue. It was a big work with infinite details, and no part of it was slighted or neglected. This committee included the following men: John G. Clark, chairman; Charles H. Frazier, John H. Gibbon, Robert G. Le Conte, William L. Rodman, George E. de Schweinitz, Edward P. Davis, John B. Deaver, William B. Van Lennep, Edward Martin, J. Montgomery Baldy, E. E. Montgomery, Barton Cooke Hirst and John B. Roberts.

THE NEW OFFICERS

Dr. Edward Martin of Philadelphia was chosen President and Dr. George Emerson Brewer of New York, Vice-President. The General Secretary, Treasurer and General Manager were re-elected.

RECEPTION TO THE PRESIDENT AND PRESIDENT-ELECT

On Friday evening, November 17th, a reception was given by the Medical Club of Philadelphia, of which Dr. W. L. Rodman is president, to the President, Dr. A. J. Ochsner, and Dr. Edward Martin, President-elect of the Clinical Congress.

The reception was preceded by a dinner given by Dr. Rodman, at which a number of distinguished guests, including the officers of the Congress, were entertained. The reception was held in the ball room of the Bellevue-Stratford, and constituted a very fitting curtain to the Philadelphia meeting of the Clinical Congress of Surgeons of North America.

NEW YORK THE NEXT MEETING PLACE

Several informal invitations were sent to the Secretary of the Congress from three large cities during the two weeks of the meeting. Two inquiries more formal than the others came from New York City. As this latter city seemed the most available place for the next meeting, on Thursday, November 16th, the Secretary of the Congress met an informal committee of New York surgeons in New York City. This committee consisted of the newly elected Vice-President of the Congress and in addition the following representative men: George Woolsey, John O. Polak, J. W. Markoe, Le Roy Broun, Brooks Wells, Charles H. Peck, Arpad Gerster, R. L. Dickinson, Willy Meyer and Robert Morris. After a thorough discussion of the advantages and responsibilities of such an undertaking the informal committee voted unanimously to extend an invitation to the Congress to hold its next session in that city in November, 1912, and requested the Secretary of the Congress to appoint a committee to nominate a formal committee of arrangements.

CHICAGO MEDICAL SOCIETY AND CHICAGO SURGICAL SOCIETY

JOINT MEETING HELD IN THE NORTHWESTERN UNIVERSITY BUILDING, MAY 10, 1911

Dr. JACOB FRANK called the meeting to order, and occupied the chair.

DR. L. A. GREENSFELDER presented a paper on "Submucoid Lipoma of the Transverse Colon," and exhibited a specimen.

DR. ALEX. HUGH FERGUSON then read a paper on "Raynaud's Disease (Malum Perforans); with report of a case." (See p. 597.)

DISCUSSION

DR. L. HARRISON METTLER: I had the opportunity of seeing this case only once, and the history has been given to you in such detail by Dr. Ferguson that I think it is hardly necessary for me to go into that. He has given you the surgical appearance of the limb. I will state that the sensations in both limbs were decidedly diminished to all three common forms of sensation. There was no anæsthesia. The reflexes were diminished, and there was a slight wasting or appearance of mal-development of the right limb as well as this appearance, which of course is typical of the left limb.

As to the history of the case, as I recollect having seen it last year, there was a marked neuropathic tendency in the family. The grandfather had some trouble which I could not get a clear history of; but they said it was a traumatism of one of the legs that never would heal up. There was a marked neuropathic tendency in the parentage. The girl was born naturally, as far as the parents knew, but at the age of three they noticed that she began to walk with a peculiar movement which they could not describe any better than as a slight dragging of the foot. A few sores appeared; and from that time on the history, as Dr. Ferguson has given it to you in detail, was all we could get.

The point I would like to bring particularly to the attention of the Society is that the moment we enter the field of the vaso-motor and trophoneuroses we are in a very uncertain field according to the knowledge of the present day. We called this Raynaud's disease. To be sure it wasn't quite typical. We haven't the clear picture of the clinical symptoms, followed by asphyxia, and in a certain proportion of cases by a line of demarcation with gangrene, all this occurring on and off, especially in the extremities, nose, lips, ears, buttocks or any part of the body. Nor have we the clear, typical history in this case. On the other hand we have no definite explanation for the congenital origin of this trouble unless we fall back upon some vaso-motor disturbance in the spinal cord.

We have given up at last the term of *symmetrical gangrene* in connection with Raynaud's disease. It is misleading. Some cases are asymmetrical. We are not fully prepared to say the trouble is due to a neuritis or endarteritis as some are. Many pathologists are convinced that neuritis and endarteritis are simply among the predisposing causes of the clinical picture which we call Raynaud's disease. At the present time there is one thing which is very impressive, namely, that these tropho-neuroses, including Raynaud's and a number of others, present clinical syndromes many of which are found, as you are well aware, in other well-recognized pathological conditions, such as multiple arthritis and tabes. Tropho-neuritic syndromes are found in brain diseases such as tumors and other forms of brain lesion; and even in such conditions as hysteria and other functional troubles. They are found in peripheral troubles like multiple neuritis. They are also found in general cachexia, diabetes, Bright's disease, some conditions lying behind intermittent globinuria. All of which being the case we are thrown back on the fact that these tropho-neuroses are largely if not wholly mere syndromes associated with a variety of infective processes, such as syphilis, tuberculosis, malaria, rheumatism, and with distinct organic lesions of a degenerative and inflammatory character in various parts of the nervous system anywhere from the periphery to the cortex. That has led many pathologists to believe that after all these diseases are merely secondary to involvement of the vaso-motor system. Now this system includes the ganglia of the blood-vessels, their connection with the middle horns up and down the spinal cord, together with Clark's column, the great general controlling center in the medulla, and finally some unknown part of the cortex. The latter is

shown in hysterical blushing and so forth. Thus do we recognize that the cortex controls the medulla, the latter the vaso-motor centers in the spinal cord, and these in turn the sympathetic plexuses and the ganglia in the blood-vessels. Therefore in such diseases as multiple neuritis, tumors of the cord, abscesses, old cicatricial conditions, in a word, disease from the periphery to the brain, all the way up we may have any of the various forms of the tropho-neuroses. This is the great fact which we should recognize when they come into our call, that after noting the syndrome we must hunt for evidences of tabes, multiple neuritis, multiple sclerosis or any one of a dozen or more different pathological conditions liable to cause involvement of the vaso-motor apparatus. I could not discover any such trouble in this patient, so Dr. Ferguson and I concluded that it would be safe to use the term "Raynaud's disease," although the case was not typical. This diagnosis fitted better more than anything else. I hope some day we will know more about these tropho-neurotic diseases than the pathologists are able to tell us now.

Dr. Carl Beck: In the last number of the International Clinic I published a case of Raynaud's disease that happened to come under my care at the County Hospital. It was a colored man who had symmetrical gangrene and all the typical symptoms of Raynaud's disease. The reason I mention this case is because I think Dr. Mettler's remark that endarteritis might be secondary and not primary seems to be borne out in this case. This case had a history of about nine years. This colored man has had gradual gangrene, falling off of the toes, and shriveling up of both feet similar to this case, only it was a more extensive gangrene. Both limbs were thin, and the skin dry, showing the typical symptoms. I decided to make an experiment with suturing the blood-vessels, an arteriovenous anastomosis. I performed the operation in the clinic and a strange thing occurred, immediate demarcation followed, which had not occurred for eight years, on the side of operation. I thought this was a demonstration of the fact that it was an endarteritis, but after a few weeks the other limb began to demarcate also, and the whole theory was thrown overboard. We made a double amputation after that, and observed a very peculiar symptom. I had both internes operate at the same time, and I watched the operation. On the one side there was a live spurting of a bleeding vessel, and on the other side a parenchymatous bleeding. They both healed by primary union, and endarteritis was shown on both sides.

SYMPOSIUM — TREATMENT OF FRACTURES

This symposium consisted of the following papers:

"Treatment of Fractures into the Joints," by Dr. D. W. Graham.

"Treatment of Compound Fractures," Dr. Carl Beck.

"Treatment of Ununited Fractures," Dr. N. M. Percy.

"Treatment of Fractures of the Long Bones," by Dr. William Hessert.

"Treatment of Fractures of the Vertebræ and Ribs," Dr. Lawrence Ryan.

"Treatment of Fractures of the Pelvis," Dr. D. A. K. Steele.

DISCUSSION

Dr. Eaves, London, England: I have listened with great interest to-night to the discussions, and two of them impressed me very much. The first was the admirable results spoken of by Dr. Percy, and the next was Dr. Hessert's discussion. The plates are of no account at all if they are removed. The only cases in which they are removed are fractures of the tibia, in which you have to put the plate on the subcutaneous aspect. It irritates the skin and has to be removed, but as regards actual infection, there is never any present. The only cases in which we have any difficulty are compound fractures, and in those it is best to follow the routine described by Dr. Carl Beck, to wait until the limb gets in an aseptic condition, and then resort to screws. In some cases we have gotten excellent results by taking the longest screw we could find, and screwing it in long ways of the fracture. All these cases have healed up.

The treatment of fractures cannot be taken up by any one not acquainted with the technique of the operation. You should be aseptic to the finest degree, and in bone operations you have to be doubly aseptic. In London we look upon Mr. Lane as being ideal in asepsis. First of all, we shave the limb to get off as much of the thick epidermis as possible. Then we soak it in a long compress the night before. Then it is left alone until the time of operation. Then iodine is put on, and when the incision is made, which is a good long one, the skin should be carefully padded so that no infection can take place into the wound. Then as regards the treatment and the instruments, even the swab should not be touched by your hand. In all treatment your hand should never come within eight inches of the wound. Each swab should be kept in a sterile bowl, and

after it is used thrown away. In femur operations the catgut should not be touched by your hands. The needle should be held in your hand and threaded, and the muscles brought together. An instrument that is once used should be reboiled. That is the whole secret of the technique of your treatment with Lane plates.

DR. A. H. FERGUSON: In a number of the so-called simple fractures of the thigh or of the tibia, where the apposition can be obtained without any difficulty, these patients suffer a great deal by the application of a splint, or any of the ordinary methods of treatment. I shave such a limb, puncture it in a number of places, and put it up in a mammoth antiseptic dressing. There is no pain whatever. In simple fractures of the patella with traumatic synovitis, where approximation is impossible on account of the blood or serum inside of the joint, I drain the joint with silkworm gut. Then the fragments can be brought together at once. This must be done under all aseptic precautions, just the same as Dr. Eaves says regarding operations, which we all know. In two of my cases I drove a nail in and buried its head, and that is practically all the splint you need. I saw one of Murphy's results in a case of Pott's fracture. It was excellent. The open method is not very frequently resorted to, and it makes no difference how you wire such fractures, you are liable to have non-union. Charles Mayo some years ago devised and resorted to the open method, simply packing with iodoform gauze, and allowing granulation to be stored up in that way. In a few cases where they would not unite I removed a portion of the shin bone, chopped it up and left it in between the pieces, and got an excellent result. A rib, for instance, makes a very good interosseous splint for the femur. Three years ago I exhibited a number of very interesting specimens before the International Surgical Society, showing how a very large plug of ivory becomes incorporated into the femur above, and forms a new joint. This subject is very interesting, and every man had has his own experiences with these cases.

DR. WILLIAM FULLER: I desire to add a word to what Dr. Beck has said about the treatment of compound fractures. I am not so afraid to wash these compound fractures, although what Dr. Beck has said will be sufficient to cleanse many of them.

The wound is made very clean first and the bones, if protruding, are sufficiently cleaned before being drawn within the wound. A compress from bichlorid solution is firmly held to this wound while the remainder of the limb is being subjected to a thorough scrubbing. The whole leg including the wound is then well coated with iodine. The limb is now slit up, if needed, at several points above, below, and around the fracture, to release the tension and provide for subsequent drainage.

The limb is now (wholly ignoring the fracture) swathed in a large moist antiseptic dressing and placed between well-fitting splints which are fixed in place, not by the turn of bandages, but by bandage strips two feet long tied at intervals of four or five inches around the splints. This enables the immediate tightening or loosening the splints at a moment's notice, at the place desired; this method is used by little manipulation of the limb, is a light dressing, and has other advantages. The next step, the most important of all in treating fractures of any description, or infections without fractures, is the extreme elevation of the limb. This elevation is not accomplished by placing the limb on pillows but by suspending it on a frame which will hold the limb at a right angle or practically that, to the plane of the bed. The advantages of this one step cannot be made plain by words but by trial only.

In accordance with this method I have for years treated compound fractures and have under my care now one of the most serious compound comminuted fractures of the tibia and fibula I have ever seen. I have here two X-ray pictures showing the condition as described. This man, aged fifty years, received this injury fourteen days ago and with the treatment as described, his condition has remained normal except two days when his temperature reached 100° F. due to allowing his leg to rest upon the bed, without elevation.

My intentions were to operate upon this patient to-morrow, but after hearing the advice of Dr. Hessert, I hesitate to so so. If this fracture, the ugly deformity of which is shown so well by the X-ray, can be properly managed by any means aside from operative ones, then I shall remove my hat to the surgeon that can do it and turn the case over to him.

I might add that since this discussion this case has been operated on, showing a condition not possible of correction by any manipulation of a non-operative character.

DR. M. L. HARRIS: It is too late to enter into details, but just a few general suggestions. In the first place, the introduction of the X-ray has caused the patient to demand better cosmetic results, as he can see if his bones are not in good apposition. That means the open method of

treatment. I believe every fracture of a long bone which cannot be brought in practically perfect alignment should be operated on unless, of course, there are contraindications. Fractures should not be operated on by everybody. A laparotomy is a simple matter compared to the treatment of a fracture. The care necessary to openly treat a fracture is infinitely greater than to do an ordinary laparotomy. The peritoneum is good and kind, and will take care of a large amount of infection, which the tissues about a fracture cannot do. I agree with Dr. Hessert when he says we should never undertake to operate on a fracture unless we are properly provided with instruments. It is absolutely essential to good aseptic results.

Dr. Graham, closing the discussion: Regarding the nailing in Colles' and Pott's fracture, it is known, I think, that these two fractures are easily kept in place if properly reduced. Therefore I think the nails Dr. Ferguson used are wasted, not needed at all.

In regard to the treatment of the shaft of long bones, in some cases I would prefer an ivory dowel plate in the medullary cavity rather than a plate. The dowel pin can be used in the humerus and also the femur sometimes. When it can be introduced easily I think it is superior to the plates.

Dr. Hessert, closing the discussion: The question as to the frequency with which plates and mechanical appliances have to be removed is one upon which I have been unable to gather satisfactory statistics. My own experience is that over fifty per cent of the plates have to be removed. I have never had an infection, but little sinuses form which refuse to heal until the plate is removed.

There is no question but that when screws are introduced they will cause necrosis at the point of insertion. Inasmuch as they are foreign bodies they will be irritants and I think in the majority of cases they will have to come out.

In regard to Dr. Fuller's question, if he will send that patient to the Alexian Brothers Hospital I will take care of him. I would put the patient asleep, make powerful extension, and put on a plaster cast.

CHICAGO GYNECOLOGICAL SOCIETY

A Special Clinical Meeting was held at the Michael Reese Hospital, April 21, 1911, with the President, Dr. Gustav Kolischer, in the Chair

Dr. L. E. Frankenthal read a paper on "Fibromyomata, from the Standpoint of the Gynecologist and Obstetrician," which appears in this issue. (See p. 636.)

DISCUSSION

Dr. Henry Banga: Dr. Frankenthal has covered the subject so thoroughly that there is little to add. I do not remember whether the doctor recommended giving digitalis in preparing patients for operation. When the heart seems weak, I give digitalis for about a week, up to the day of operation, to obtain distinct reaction.

While in most cases of uterine fibroma we all agree as to the indication for an immediate operation, in quite a few cases it is difficult to advise correctly whether to operate or to wait for developments, because the patients are girls or young women, naturally anxious to keep their genitals, or are, for some reason, possessed of fear as to the outcome of an operation. In such a case we keenly feel our inability to foretell whether the fibroma will grow, shrink, slough, be born, or become malignant. Our ignorance in the matter is, in a measure due to the fact that large series of true clinical histories of the whole life of fibromata, that might help us to solve the secrets of the origin and course of the growth of such tumors, are not on record, because such patients too often change doctors, so that each observer sees the case at a different stage, unaware of what preceded and what is to follow. Here becomes true Hippocrates' saying: "Art is long; life is short." To illustrate these remarks, I give the histories of two cases of uterine fibroma, as follows:

Case 1. Six years ago a girl of eighteen, working in a cigar factory, came to me for advice on account of excessive menstrual flow and general weakness. She was delicately built, and pale. She stated that she began menstruating when twelve, regularly, lasting five days, without pain, rather profusely. Since about six months, the menstrual flow became gradually more profuse,

lasting eight days, slightly painful. Diagnosing the case as one of chlorosis, I prescribed Blaud's pills. Four months later, the menstruation having meanwhile increased to nine and ten days, and pain in back and abdomen having become a prominent feature, I made a bimanual examination per rectum, under anæsthesia, to ascertain whether a fibroma was present. The examination was negative as to this. The uterus appeared in normal condition, rather long, slender, smooth, freely movable. I advised the patient to continue with her pills and to report from month to month. These reports showed the condition as gradually getting worse, the flow lasting longer and the pains becoming labor-like. I therefore made a second examination, six months after the first one, when I found this change: The fundus was decidedly thicker, in an anteroposterior diameter; also harder, but quite symmetrical, smooth, without knolls. The uterus seemed shorter. I interpreted this finding as indicating the presence of a fibroma in the center of the fundus, and the uterus at work to push the fibroma towards the cervix. I thought it quite reasonable to expect that finally a birth-like expulsion of the tumor into the vagina would occur. Hence I explained as best I could my view of the uterine condition to the patient and urged her to be brave and to stand the pains longer, until the dilatation of the uterus was ample to allow the removal of the tumor per vaginam. I also prescribed fluid extract of hydrastis, twenty drops three times daily, and asked her to report every month. She did so for six months, the condition remaining the same, when she stopped coming. About four months later one day Dr. Senn told me that the following morning, at the Presbyterian Hospital, he intended to laprotomize a former patient of mine with a uterine fibroma, and that he was going to do his "conservative fibromectomy," i. e., incising the exposed uterus to get at the fibroma, removing the fibroma, sewing the uterus, and close the abdomen. I at once recognized that the Doctor referred to my fibroma girl, and so gladly promised to be present at the operation. The same evening I was telephoned for, to see the patient next morning at her house. I went and learned that during the time I had not seen her, her friends, much against her wish, had taken her to a number of our colleagues, who were quite unanimous in advising immediate abdominal hysterectomy, and that she finally went to the Presbyterian Hospital because Dr. Senn had promised to save the uterus, and that she ran away the evening before the operation to consult me again, because she still clung to my promise that the tumor might be expelled by itself. She also told me that she felt much easier of late; that the hæmorrhages were not bad any more, and the pains, too, were less severe. On examination, it being just ten months since I last examined the patient, I found that the uterus was quite round, almost like a small billiard ball, hard, apparently contracted, and that the cervix had become about effaced, the os slightly dilated, a condition indicating that the expulsion of the fibroma was in sight. Since the general condition was so much better, I advised the patient to come to the hospital in four weeks, provided the pains should not grow worse before then. She came at the time set. The os uteri, exposed in a Sims' speculum, appeared dilated to admit the end of the little finger, and in it showed a white, glistening body, round and smooth, like the head presenting at the beginning of dilatation of the os in a perfectly characteristic primiparus birth. After incising the os to the right and the left, I caught the fibroma with a vulsellum, twisted it until it was loose, and extracted it slowly through the yielding os. It was perfectly round, of the size of a small apple. The closure of the incision ended the operation. Soon after menstruation appeared without pain, lasting five days, the flow being moderate. It has continued to occur regularly ever since. On examination, six months later, the uterus appeared normal as to size, mobility, position, and even the os uteri and the cervix gave hardly any evidence of the birth of the fibroma to one unfamiliar with the case.

Case 2. A woman of 39; O-para; was seen by me in 1890 on account of an abdominal tumor, symmetrical, oval-shaped, reaching almost to the umbilicus. The patient had noticed the gradual development of a growth in the lower abdomen for the last ten years, more so during the last three years. She had, especially of late, a good deal of pain and general discomfort in the abdomen; was troubled with flatulency, constipation. The menses were not excessive, but lasted longer than formerly. No physician had heretofore been consulted because the patient shunned any operative treatment. I could, therefore, do no more than prescribe hydrastis, twenty drops three times daily, and give advice as to diet and regulation of the bowels, and ask the patient to keep me posted as to the abdominal growth. I spoke to the woman a year later, without examining her, and learned that she was satisfied with her condition and that apparently the tumor did not grow. I was called to see the patient again in 1901, on account of a bloody discharge, when she told me that she had taken hydrastis all along for eleven

years; that the tumor gradually "disappeared"; that two years ago, when she was 47, her menses had stopped altogether up to the day of my visit. When I looked at the abdomen, the former "six-months' pregnancy-like" tumor was gone, and bimanually I judged what was left to be of the size of a two to three months' pregnant uterus. It was quite hard, a little knotty, but symmetrical, and out of the os hung a small polypoid growth, which caused the bleeding. I twisted it off and the bleeding ceased. Eight years later, in 1909, I was again called to see the patient, on account of bleeding from the vagina. I found her at the Deaconess' Hospital, where she had been taken because of her helplessness following repeated apoplectic strokes. She had been bleeding for a few weeks, first very little, more profuse the last three days, when she also complained of pain in the back and abdomen. Examination showed that the uterus was in the midst of expelling an intrauterine fibroma of the size of a small orange, which was easily twisted off, when the hæmorrhage ceased. A few days later the patient died from her apoplectic trouble.

Dr. Jacob Frank: I have had a few of these cases in the last twenty-five years. The first was that of a woman, six or seven months' pregnant, who complained of bowel and bladder disturbances. I examined her and confirmed the pregnancy, and also found a large fibroid on the right side, about the size of a fœtal head. This was early in my career, and I did not know what to do. I told her that I thought a delivery would be the best thing. I induced labor and it passed off normally. Later she developed a temperature and I thought she was septic. After several weeks she had become quite emaciated. The skin of the tumor was red, as though the tumor were suppurating. I was afraid to remove the uterus on account of sepsis, so I incised the skin, and to my surprise found a fibroid. I lifted it out and there was a granulating cavity. The woman made a complete recovery.

In another case the woman was delivered by forceps of a normal child. I examined her and saw a large mass protruding from the vulva, which looked like an inverted uterus. I found that it was a fibroid, however. I removed it and found a partially inverted uterus. I operated successfully, the woman making a complete recovery.

The third case was that of a woman who aborted at eight months. She had a large suppurating gangrenous fibroid. There was no fever. I got away as much as I thought was necessary, irrigated twice a day, and each time masses of suppurating fibroid came away. After a period of a few weeks the entire tumor had come away, the uterus contracted, and the woman made a complete recovery, going home with a practically normal uterus.

Another case was that of a young lady with a small fibroid in the right side. I suggested an operation, but she refused. She married and gave birth to a living child. There was no hæmorrhage. After she got well I examined her and found the uterus full of fibroids. Three months after the baby was born I did a hysterectomy. She also recovered.

AMERICAN ASSOCIATION OF OBSTETRICIANS AND GYNECOLOGISTS

Twenty-fourth Annual Meeting, Held in Louisville, Kentucky, September 26, 27, 28, 1911. The President, Dr. Herman E. Hayd, Buffalo, New York, in the Chair

The meeting was held at the Seelbach Hotel, and after addresses of welcome, which were delivered by Dr. Lewis S. McMurtry and the Mayor of Louisville, Hon. William O. Head, which were responded to by Dr. Charles N. Smith, Toledo, the reading of papers was begun.

ANOTHER PROTEST AGAINST THE ROUTINE USE OF PURGATIVES

Dr. Edwin Walker, of Evansville, Indiana, stated that purgatives were used entirely too often by the profession and laity. Nearly all who consulted a physician used purgatives habitually. This routine use was vicious, and did much harm. This condition was due to their excessive use by the profession. A patient, when he first consulted a doctor, almost always received a laxative, and when he was dismissed he was directed to use it when necessary. All patients received a purgative before a surgical operation; this was a routine with practically all surgeons in and out of hospitals. Was it

good practice to assume that every one who required a surgical operation likewise required a purge? If there was fecal accumulation it should present some symptoms. A large number of these patients had no disease or trouble with the alimentary canal. It was rare to find anything in the small intestine except in emergency operations soon after a full meal. If there was fecal retention, it was in the colon and an enema was the better way to remove it. If there was fecal impaction a simple purge would not remove it, several days at least would be necessary. The purgative increased the amount of fluid and also stimulated germ activity which rendered the condition less favorable for an operation on the intestine or elsewhere.

For seven years he had carefully recorded in all cases the habit in regard to purgatives, and he found over ninety per cent of his cases used them habitually. Of this number, all but a very small percentage were relieved of their constipation or other trouble as soon as the cathartics were withdrawn and regular habits and a suitable diet were adopted. The small number not thus relieved suffered with some trouble, organic or otherwise, which required treatment in which purgatives played a very small part. Careful study of cases with more accurate diagnosis would almost do away with the habitual use of laxative drugs. The purge after a surgical operation was needed in some cases to prevent accumulation in the rectum, which was not serious but caused some discomfort. Quietude and a limited diet were the causes of their failure to act, and when a liberal diet could be taken, laxatives were rarely required. The purgatives could not remove infection. For local or general peritonitis following a laparotomy a purgative was contraindicated. Ochsner's treatment for appendicitis was applicable to these cases, as its aim was to inhibit peristalsis. Much had been written to emphasize this, but still physicians were purging these patients to their injury. When no infection existed, recovery with the exception noted above was better without a laxative. For seven years he had not given a purge for a surgical operation, except in rare cases, not one per cent. Patients were stronger and in a better condition for the ordeal. They had done better in every way, were more comfortable, and the abdominal cases had less pain and tympany. Gas pains were much less frequent. They had no complications which could be ascribed to the omission of the purge. The routine purgation of all surgical cases was absurd, was contrary to reason, and should be abandoned.

DISCUSSION

Dr. E. Gustav Zinke, of Cincinnati, said it was his practice to take a daily scant teaspoonful of epsom salts. After this was taken the bowels acted naturally and satisfactorily in from fifteen to twenty minutes after breakfast. This must be associated with a mixed diet, solid food, and exercise, to keep the tone of the muscular structure of the colon in its natural condition. Diet and exercise, with a little saline every morning before breakfast, would answer in the vast majority of cases.

Dr. H. W. Longyear, of Detroit, said there was one place where the protest of the essayist was certainly warranted, and that was, if one gave cathartics in cases of enteroptosis, it was extremely harmful. There was nothing more injurious than that except the habit perhaps of prescribing very commonly cathartics in such cases without making a diagnosis. If the practitioner had a colon to deal with which was angulated and dropped down into the pelvis, if he gave the patient having that trouble cathartics, he was going to do him or her as the case might be, a vast amount of harm. He was whipping the colon into an increasing action. It was like whipping a tired horse. He would get a little response from the whip, but the animal was injured. And so it was with the colon. If one constantly whipped it up with cathartics, he would make it worse and worse.

Dr. William H. Humiston, of Cleveland, stated that a great many practitioners had been guilty of prescribing purgatives when they should not do so. A distinction should be made between a purgative and a laxative. A purgative was an irritating medicine always, while a laxative was not. He did not know how he could treat a number of cases that he saw that suffered from constipation associated with the diseases peculiar to women without regularity of the bowels. There were women who came to the practitioner who did not have a bowel movement more than once in two or three days, or oftentimes only once a week. He did not give these patients purgatives, but he would dislike to continue the practice of his specialty unless he could avail himself of the benefits of what he called tonic laxatives. Take the cases of long-standing constipation he saw, and with the form of tonic laxative he used he was enabled within six weeks by constantly decreasing doses to establish the regularity of the bowels. After establishing regularity of the bowels, and the constipation had been apparently corrected, in examining these patients one might find disease of the pelvic

organs, disease of the rectum, such as hæmorrhoids and fissure, which he naturally saw when he treated cases of diseases peculiar to women. The form of tonic laxative he gave these patients was composed of cascara, strychnia, the active principle of aloin, in small doses, with a little ipecac, made up in pill form and gelatin coated. In his abdominal operations, where the patients were in the hospital, he had the bowels thoroughly cleaned out two days before operation by the administration of a dose of castor oil. A short time before the operation a high enema was given.

Dr. Joseph M. Mathews, of Louisville, thought that six-tenths of the people were constipated. If this was true, what were we going to do to unload their bowels? What harm could a purgative or laxative do if one gave it two days before an operation to unload the bowel of toxins or of fecal matter? It was known that every one had fecal matter in the colon, if not in the small bowel, and all one had to do to assure himself that this was true was to take a purgative and find out how much more he would pass after the administration of it than when he did not. Coming to his office for perhaps every day in the week for many years had been patients who were perfectly willing to go under the knife, and for what? For constipation. They were not suffering from any acute disease so far as he could see; they were not suffering from any marked pathological condition, but they were willing to submit to anything that he told them to do. Dr. Walker's experience had been absolutely different from his. When a patient came to him and complained of constipation, and that she was compelled every night to take from two to five pills to move her bowels, something must be done to afford that patient relief. He recalled the case of a girl, twenty-one years of age, who had to take from six to eight or ten pills in order to get movements of the bowels. What was one going to do for this type of woman? Take a woman who came into the office for an operation, for the removal of an abdominal tumor. Naturally one would put her in the hospital until he found out what was the matter with her. If one would study his cases in the hospital these patients would be perfectly willing to pay the money for it; they were willing to do anything told them. They were willing to undergo Mr. Lane's operation for the relief of constipation. That being the case, it was not ridiculous to say to these women, "Go to the hospital until I find out what is the matter with you." There might be some pathological condition that would require a surgical operation. One might operate for the removal of a tumor, and yet the patient would have constipation just the same. No one could tell him that these toxins confined in the body for weeks and months and even years did not do the general condition of the patient harm, for they certainly did. Therefore, the daily administration of a laxative that Dr. Humiston spoke of, and that Dr. Zinke carried in his pocket and took every morning, was a good thing. Why not? The bowel was the sewer of the body, and why not wash it out, and what harm did it do to wash it out? One could not simply prescribe a purgative and allow these patients to go. They required as careful watching as a case of amebic dysentery. They would not be relieved, and one could not relieve them by prescribing a purgative. Many of them had pathological conditions and in many of them there was an atonic condition of the bowel, whatever that might mean. Peristalsis was impaired, and this must be excited, but it would take a long time to overcome the constipation from which some of these patients suffered, but when the practitioner succeeded in doing so these patients would bless him. For a great many years he had given purgatives to patients two or three days before operating on them to empty the bowel. He had given crab-orchard salts, as it surpassed all other salts, and it would do its work when epsom salts would not do so. He had for thirty years given these salts two or three days prior to operation, and sometimes it was surprising to note the amount of fecal matter a patient would pass. In many instances the condition of some of these patients who suffered from constipation was a surgical one, and oftentimes one was warranted with Mr. Lane and Mr. Mummery in removing the colon.

Dr. Hugo O. Pantzer, Indianapolis, said he would not denounce the routine use of purgatives as strongly as did the essayist. He emphasized one point that was not usually observed, namely, to assume that a single bowel movement for each twenty-four hours was a cause of constipation in a vast majority of cases was radically wrong. There was no organ in the body that absorbed moisture with greater avidity than did the rectum, the stomach being secondary in this regard, and that meant intestinal autointoxication. If there was anything he had learned before, during, and after operation, it was that the specific gravity of the urine and the quantity of urea and other indications of normal elimination by the kidneys were diminished, and owing largely to constipation. There was inconvenience for the average

human being to go to the closet whenever he or she, as the case might be, felt the desire, and hence nature's call was frequently disregarded, but we should invariably after we felt this prompting act upon it to eliminate by the rectum. It was the rectal retention of feces that did great harm.

Dr. Charles L. Bonifield, of Cincinnati, stated that it was necessary for the majority of people to have at least one evacuation of the bowels every twenty-four hours, and most people would be better off if they had more frequent evacuations. The essayist to some extent answered the question himself when he told how prevalent it was for the laity themselves to take laxatives. They used laxatives for the reason that they felt better after a free bowel movement. He had not succeeded very well in relieving many of these patients with a simple diet, but he had cured many of them by removing their hæmorrhoids. A great many patients were constipated because the movement of the bowels was attended with more or less pain, and on account of this discomfort they put off going to stool as long as possible. In inflammatory conditions of the pelvis, he knew of nothing except the prolonged use of hot douches that had so much tendency to deplete the congested pelvic organs as a free calomel purge, followed by a saline cathartic.

Dr. James F. Baldwin, of Columbus, said that when patients came to him with constipation as a marked symptom, he sent them to a professional friend who made diseases of the alimentary canal a specialty. He examined the stomach and alimentary canal in general, the stools, gave enemas, douches, etc., and if after a few weeks or months he found he could not cure these patients, the speaker himself took them in hand and made a modification of the Lane operation, namely, switching the ileum from the beginning of the colon to the sigmoid, throwing it from one side to the other, as a man would throw a switch. He had had no deaths from this operation, no morbidity, and the operation had given him in these bad cases excellent results.

TREATMENT OF SLIDING HERNIA

Dr. Walter C. G. Kirchner, of St. Louis, after discussing the etiology, nature, and diagnosis of sliding hernia, described a method which he had employed in the treatment of these conditions. The principal steps of the operation were to convert immovable or adherent bowel into movable bowel; to make complete reduction possible; to construct the partial or incomplete sac into a normal complete sac; to permit ligation of the sac high up beyond the ring; to enable the complete repair of the hernia to be made by one of the typical and accepted operations for hernia. In his operation the sac, after it had been isolated, was incised on either side, near and parallel to the bowel, and in this way the bowel was provided with two lateral flaps of sac. The adherent bowel having been made movable beyond the ring, the sac flaps were turned back and sewed over the denuded area of bowel, and reposition of bowel into the abdominal cavity was thus made easy. The next step lay in the partial reconstruction of the sac so that ligation or suture at the neck as in normal cases was made possible.

Of the fifteen cases of hernias operated on by the reconstruction of the sac and the flap method, ten were sliding hernias of the sigmoid, and five were sliding hernias of the cecum. All the cases occurred in adult male patients. In one case, the sliding hernia was through the femoral ring, there being also present a right and a left inguinal hernia. In eight cases there were double inguinal hernias, and in two instances these were complicated by femoral hernias. Undescended testicle was encountered once, and hydrocele four times. In the fifteen cases twenty-five separate herniotomies were performed, all the cases making a satisfactory recovery.

In conclusion, he emphasized the following points: 1. That a sliding hernia was irreducible by any of the non-operable methods, and that a truss when worn might be harmful and painful. 2. That in these cases the usual surgical methods for treatment of hernia failed in their lasting results, and that recurrences were frequent. 3. That for success it was necessary to free the bowel so that it might be properly replaced, and to completely obliterate the sac. 4. That the method had proven successful, and that the steps of the procedure were applicable in the majority of cases, so that the method of repair might be considered typical.

DISCUSSION

Dr. John Young Brown, of St. Louis, said that his experience had been limited to five cases, and he had had the opportunity of seeing Dr. Kirchner operate in six or eight of his cases. In the cases that had come under his observation the hernia had been on the right side. In three of them the cecum and appendix were densely adherent to the sac, making it difficult to liberate the adhesions, and he had found that the method advocated by the essayist of converting this complicated variety of hernia into a simple one, so that one could do the radical operation, had been of the greatest possible value to him.

There was one thing in dealing with these hernias that must be carefully avoided. The sac was incomplete. In one of his cases in endeavoring to open the sac, the bowel being attached behind, he came near getting into the bowel proper. This sliding variety of hernia was attached behind by the folds of mesentery, and by opening the sac in front, lifting up the bowel in the manner in which he had described, cutting the sac at right angles, one should see to it that the bowel was returned so that there would be no constriction of at it this point.

ANGIOMA OF THE UTERUS, BLADDER, AND BROAD LIGAMENT

Dr. Hugo O. Pantzer, of Indianapolis, reported a case of racemose angioma of the uterus, bladder, urethra, and broad ligament. The patient was twenty-six years of age, married, went through three pregnancies, two of which terminated at full term by forceps delivery. The cause of the dystocia was unknown. Both of the children were born dead. The third pregnancy terminated in the second month, probably owing to the angioma. This event was followed by grave hæmaturia and vesical tenesmus, excessive metrorrhagia and menorrhagia. A fatal issue was averted by celiotomy and circumambient ligation. There was no more hæmaturia except transient shortly after operating, provoked by exposure to cold and subsequent acute bronchitis and coughing. This attack of hæmaturia lasted two weeks, then it disappeared. Vesical irritability subsided gradually and permanently. Menstruation, which was at first profuse and prolonged, gradually became normal. One year and a half later the patient developed suppurative appendicitis. Operation revealed a recurrence of the angioma in the broad ligament external to the previous seat of the neoplasm. Ligation was again resorted to. Examination of the patient two years after the first operation revealed the non-presence of angiomatous growth. There had been no return of the hæmaturia. The bladder was not irritable. Menstruation was normal. The general health of the patient was good.

DISCUSSION

Dr. Walter B. Dorsett, of St. Louis, said he had had two cases of angioma of the uterus in which he had taken out the organ, and he understood the essayist to say that he did not remove the uterus in his case. If so, so much the better, for this was an advance in surgery. In operating on these cases, in which there was a suspicion of angioma on account of hæmorrhage, which was the greatest difficulty encountered, he thought the ligation of the vessels, ovarian and uterine, was best made by the *en masse* method, that is, to grasp the whole mass with a good strong forceps and ligate on the outside of the forceps. In one of his cases he attempted to ligate the ovarian artery, and the ligature slipped off and the ovarian artery slipped up under the peritoneum. He slit up the peritoneum, seized the bleeding artery, and secured it, but the woman had a sudden hæmorrhage during the night from which she died, so that he believed in the ligation of angiomas of the uterus, where there was an abnormal condition of the arteries themselves, it was best to ligate them *en masse* and not only do so in that manner, but to sew in the suture after one had thoroughly tied it with a number two catgut ligature.

Dr. John W. Poucher, of Poughkeepsie, said that in one of these cases, after an operation had been performed by a colleague from another city, he had the after-care of the patient, but unfortunately this patient—although there was no sign of hæmorrhage at the time the angioma was ligated—suffered severely from a secondary hæmorrhage, and the family insisted upon waiting for the operator to come from a distant city, and the patient died as the result of the secondary hæmorrhage. If in all these cases one could be assured of not having a recurrent hæmorrhage, the conservative method of operating was preferable.

Dr. Francis Reder, of St. Louis, said he had met with various angiomatous conditions of the uterus in connection with fibroid tumors, where it was necessary to ablate the organ. Sometimes one met with angioma in the broad ligament, or the pampiniform plexus. He knew that in these racemose angiomas there was destruction of the anterior uterine wall, and one would find a resisting organ of considerable density.

Dr. Charles L. Bonifield, of Cincinnati, agreed with Dr. Dorsett that it was best to ligate the ovarian arteries *en masse*, and during the report of this case it struck him that it might have been possible and would have made the operation easier, had Dr. Pantzer by ligating the ovarian artery on the right side proceeded to have ligated the internal iliac artery, as was done in some cases of extensive cancer. In this way he would have controlled effectually the arterial supply of the tumor.

CONGENITAL MULTICYSTIC MUCOID TUMOR OF THE SMALL INTESTINE

Dr. H. W. Longyear, of Detroit, said the tumor was about two inches in length, situated

subperitoneally on the sides and mesenteric aspects of the small intestine and was composed of an aggregation of small cysts, filled with mucus. The pathology in the case reported was discovered accidentally during an appendectomy, and was not removed, as it was apparently benign and causing no symptoms. It was thought by some to be allied to the gas cysts of the intestine, as reported by Finney and others, although differing materially in some respects. The etiology was obscure, but such tumors were probably congenital in origin, like dermoids, developing from foreign cells, accidentally misplaced in embryo. Their growth was slow and without symptoms, excepting where the lumen of the bowel might become occluded, and they required no treatment unless the symptoms of such condition were present, when a resection of the bowel containing the tumor was indicated.

DISEASES OF THE THYROID IN THE FEMALE

DR. MILES F. PORTER, of Fort Wayne, said the thyroid was of especial interest to the gynecologist and obstetrician. Women were five times more prone to thyroid disease than men. The thyroid was originally a sex organ. The thyroid was especially active during the period of sexual activity, and increased in size during menstruation and pregnancy. The toxæmia of pregnancy and puerperal infections were probably often due to inactivity of the thyroid. Both clinical observation and postmortem findings supported this statement. Goiter might be due to disease of the genital organs. Disease of the thyroid might cause amenorrhæa, dysmenorrhæa, menorrhagia, sterility, mental aberration, premature separation of the placenta, and chlorosis. Goiter in the mother often produced bone deformities in the offspring.

He reported six cases occurring in his own practice, and cited facts supporting the above statements. Clinical investigations along the lines suggested promised an abundant harvest, and the object of his paper was to stimulate such investigation.

DISCUSSION

DR. WILLIAM D. HAGGARD, of Nashville, stated that only a few days ago, showing the relationship between the sexual function and the thyroid gland, he saw a woman with exophthalmic goiter, with very marked symptoms and hyperthyroidism, who married last November, at the age of thirty, and in January had marked enlargement of the thyroid, with tachycardia, tremor, and a beginning exophthalmos. She conceived in February, and aborted in May. During her pregnancy her symptoms were considerably exaggerated, and an interesting feature was that these symptoms all subsided after the miscarriage. She still has a chronic hyperthyroidism which had recently become more active and for which he thought a partial thyroidectomy was necessary to afford relief. He was satisfied that there was a great undiscovered country in the ductless glands bearing upon their interrelation in the causation of some of our mysterious pathology.

DR. HUGO O. PANTZER, of Indianapolis, recalled a case he had in his own practice two years ago. He removed a fibroid tumor of the uterus, doing a unilateral oöphorectomy in an individual who had at the time moderate Graves' disease. Within twenty-four hours after the operation this patient had a very conspicuous thyroid. At his visit the following morning he found that the thyroid had been as absolutely removed as though he had taken it off with a knife. Nine or ten days afterwards the patient developed bilateral trouble, and then had hyperthyroidea in the worst degree from which she recovered only slowly within the next two months.

DR. ALBERT VANDER VEER, of Albany, had been impressed with the enlarged thyroid in connection with uterine fibroids, and recalled one case that he had under observation for some time. He removed a fibroid tumor from this woman ten years ago. She was thirty-one years of age then, she had a good sized fibroid tumor, and she had a marked enlargement of the thyroid gland. Ten years after she came to him and said, "Doctor, I must be having the change of life." Her uterine appendages had been removed at the time with the fibroid, and she had gone along without any unpleasant symptoms up to this time. When she came to him, she had all the marked symptoms of goiter, with hot flashes, etc. On examining her he found that the thyroid gland was slightly enlarged. She presented many of the symptoms of exophthalmic goiter. Her case cleared up nicely under the use of the thyroid extract, but the cause of the condition and the therapeutic remedy given for it were not clear to his mind.

DR. EDWIN WALKER, of Evansville, said that a number of years ago he had an experience along this line that made a deep impression upon him. The patient came from a highly neurotic family; had suffered from epilepsy during her early life. At about puberty these attacks became worse, and a good deal of the time the patient was in the condition of status epilepticus, having from forty to sixty attacks a day. Bromides had no

effect whatever on these attacks. At that time he had a case of myxedema in a man who had his thyroid destroyed by suppuration, and as he had this subject in mind he noticed that there were a few symptoms about this girl that suggested the possibility of hypothyroidism, although practically nothing could be found in the literature on the subject. She had puffiness of the face, she had a swelling of her hands, and stiffness which resembled this patient. He put her on the thyroid extract. He fed her on partially cooked thyroids, and her recovery was so remarkable and so rapid that it did not seem to him to be possible. Whenever he would stop the administration of this thyroid extract there would be a return of the symptoms. At about that time the thyroid extract was put on the market. He kept her on thyroid extract for a year or more. She had been under his observation since that time; she was fifteen years of age then, and thirty-five years of age now, and she had been entirely relieved of her epilepsy.

Dr. Roland E. Skeel, of Cleveland, stated that last year he saw a patient who was choking rapidly because of a rapid enlargement of the thyroid. The woman was eight months' pregnant. She had an attack of dyspnœa, and she had such a severe stridor that it could be heard across the corridor. She had an enormous thyroid which was removed under local anæsthesia, and being fearful she might be delivered of an eight months' child, he ordered a small dose of morphin. To his consternation, after giving the morphin, she had a very marked toxæmia of pregnancy, so much so that the urine contained from ten to fifteen per cent of albumin. This was contrary to what was observed under these circumstances. There was a rupture of the bulb of the jugular vein, and the woman died instantly. The house surgeon made a postmortem Cæsarean section, and secured a living child. The child lived a few weeks, then died from ordinary marasmus. This case illustrated the risk the practitioner ran in drawing any definite conclusions with reference to the thyroid.

Dr William H. Humiston, of Cleveland, said that gynecologists saw many cases in which there was a rapid pulse, and a great many symptoms that they were at a loss to account for, and examination of the thyroid showed no enlargement whatsoever. His experience in these cases had been that with the administration of the thyroid extract he had universally obtained good results. He very rarely saw a failure after the administration of the thyroid extract.

Dr. Robert T. Morris, of New York City, said that if there was a hypothyroidism, the thyroid extract furnished a substance which was not furnished in sufficient quantity by the gland itself. If there was a hyperthyroidism, it often meant that there was a compensatory hypertrophy of the gland which was under great demand, and in that case, if one gave the thyroid extract he lessened the need for compensatory hypertrophy on the part of the gland, so that in certain cases of hypothyroidism and in cases of hyperthyroidism, one used precisely the same therapeutic resource because of the two different groups of cases, but each case in itself became a study. In one case one would find with the X-ray alone he could overcome almost all of the symptoms of hypo- or of hyperthyroidism, in another case with the thyroid extract he was using while in another case he had to use both together, and in still another case he would produce disastrous results with either one of the two. One could not at the present time anticipate precisely what the result was going to be from the use of the thyroid extract until he had a much more elaborate classification of these cases, and a statement of them in such a way that we might anticipate results.

Dr. Porter (closing the discussion), stated that it was not at all proven that a woman with Graves' disease was suffering from an overactive thyroid, but up to date this was our best working hypothesis. Here was a woman with a large goiter and she got better with the administration of the thyroid extract. He believed nine-tenths of these women would get better for the simple reason that an individual with a large goiter was not suffering from hyperthyroidism. It was the myxedemic patient, and not the hyperthyroid case, that suffered. The size of the thyroid cut no figure, and the patient might die from so-called Graves' disease with no enlargement of the thyroid gland.

CERVICAL FIBROIDS

Dr. Lewis F. Smead, of Toledo, said that fibroid tumors of the cervix and uterine body below the movable peritoneum had not received the attention to which the great technical difficulties of their removal entitled them. The subperitoneal variety were the most troublesome because of their immobility and the obliteration of landmarks caused by them. In fact, they belonged to a class by themselves. Fibroid tumors of the cervix were found in about five per cent of all women who had uterine fibroids. The tumors might arise in front, behind, or at the side of the cervix, but the posterior growths

were somewhat the most common. The physical characteristics of these tumors were not unusual, but the distortions of the pelvic organs, especially of the vagina and bladder were common. The cervical tumors, because of their position and their immobility, were very likely to block the birth canal. Small fibroids on the anterior cervix, projecting into the base of the bladder, might simulate almost exactly the male prostate. The bladder was usually enormously elevated and enlarged by being stretched out over the tumor. The vagina was much elongated and crowded out of position. The rectum and vagina were much thinned by pressure atrophy.

The ureters might be pushed up by a tumor or pulled up by adhesions. They might also be blocked by pressure or kinking. The rectum and sigmoid were raised up by tumors arising beneath them. One might avoid surprises and lack of preparation by a careful pre-operative diagnosis of the relations of the tumors to the pelvis. The position of the upper end of the vagina was usually the key to the situation, and an examination under ether would often locate it. The operative treatment was radical, rarely palliative. The operative removal required the use of special operative maneuvers, such as bisection of the uterus and tumor, enucleation, and excision of a large wedge of the tumor or the classical side-to-side hysterectomy. The principle of the Doyen hysterectomy could often be employed with profit. The cavity left was very liable to infection from the rectum, and would usually have to be drained, although in some cases it might be obliterated and the abdomen closed.

EARLY DIAGNOSIS OF ECTOPIC GESTATION WITH REPORT OF FOURTEEN CASES DIAGNOSED AND OPERATED UPON PREVIOUS TO THE TIME OF RUPTURE

Dr. R. R. Huggins, of Pittsburg, believed that the time had arrived when the diagnosis should be made previous to the final rupture and collapse in at least eighty per cent of the cases, provided a physician was called. When a woman whose menstrual period had been regular, missed or went beyond her time for menstruation, she would suspect pregnancy. If a flow from the vagina began in a period varying from four to five days to three weeks after the regular time, continuing more or less regularly, accompanied by pains, periodic in character, located in the hypogastrium on either side, extrauterine pregnancy should at once be suspected by the physician, unless some other well defined condition was present to account for it. The vaginal hæmorrhage might be dark colored blood, coagulated at times. At others a blood-tinged leucorrhœa, or in some instances bright red. It was sometimes described by the patient as being different from the normal menstrual flow and was therefore atypical. This hæmorrhage was doubtless due to a partial separation of the ovum from its cyst wall, or to the separation of the decidua from the uterus.

In ninety-five per cent of the cases of ectopic pregnancy seen by him the history and local symptoms had overshadowed all others and seldom in the early weeks had there been present the usual general signs of pregnancy. It was true that this did not occur in every instance. In some cases there was no history of either pain or hæmorrhage or flow of any kind, the first symptoms being that of sudden severe pain and collapse. Careful study of the history in fifty-two cases which had gone on to rupture in his own experience showed that in all but five there had been some irregularity of the normal flow and pain before the final rupture and collapse.

INTERSTITIAL PREGNANCY

Dr. N. Stone Scott, of Cleveland, stated that there were three subdivisions: external interstitial pregnancy, the only one known until recently, but had been much more frequently observed within the last few years. It was attended with danger, because rupture usually took place into the abdomen before the sixth month. The condition should be treated as a case of ordinary tubal pregnancy. Middle interstitial pregnancy was rare, only four cases having been reported. Internal interstitial pregnancy was frequently overlooked. The use of the curette was the etiological factor in the production of many of them. There were two varieties: the first one, aborting into the uterus, with spontaneous recovery. So-called false perforations of the uterus were frequently interstitial pregnancies. A number of illustrative cases have been reported lately. The second variety began as interstitial developed into the uterus, and terminated normally. The report of his own case was the first one on record.

DISCUSSION

Dr. James F. Baldwin, of Columbus, stated that several years ago at a meeting held in this city (Louisville) he read a paper on the same subject, reporting six cases in which he had made a diagnosis of ectopic pregnancy before rupture and operated. At a meeting of the American

Medical Association, held at Atlanta, Georgia, in 1896, four years before that, during a discussion in the obstetrical section he reported five cases in which he made a diagnosis of ectopic pregnancy before rupture, and took the ground that the essayist had done to-day, that the diagnosis could be made before rupture. At that time no one present had ever made the diagnosis before rupture and operated. Dr. Price, of Philadelphia, reported one case in which he made a diagnosis, rupture occurred that night, he operated on the woman the next morning, and verified his diagnosis.

Dr. Charles N. Smith, of Toledo, said that the chief obstacle to early diagnosis in extrauterine pregnancy was the fact that a patient who was not suffering continuously or seriously did not consult a physician until rupture had taken place. If one would listen to the history and analyze it and the local symptoms, as the writer of the paper had said, there could be but little excuse for failure to make a diagnosis in these cases prior to rupture.

Dr. Roland E. Skeel, of Cleveland, said that many practitioners favored certain treatment in cases of ectopic pregnancy. Surgeons need not break their necks to operate because the primary hæmorrhage would probably cease, and if it did, they must not delay operation until day after to-morrow, because another vessel might rupture, and they should operate as promptly as possible.

Dr. E. Gustav Zinke, of Cincinnati, stated that the pathology of ectopic gestation was vast, and he who had not grasped it would fail to diagnosticate cases of ectopic pregnancy or would mistake them for something else. Tubal pregnancy, with normal genitalia, was an entirely different thing from an ectopic gestation occurring in a patient with a pathological condition in the tube, the ovary, and uterus. The symptoms of a tubal abortion were entirely different from those in a case of tubal rupture. In one case, the tubal abortion, the symptoms were not alarming, and the woman might recover, and the diagnosis might remain in doubt; while a case of tubal rupture, with an otherwise normal pelvic cavity, was so typical that no man could mistake it for anything else. Again, there were ectopic gestations which were strictly tubal and remained so from the beginning to the end, and they were the cases that were comparatively free from some symptoms and went on to the end of term with a living fœtus, and they were easily removed because they were more or less pedunculated. No adhesions had taken place. In another case one might have tubal rupture and the neighboring structures might become involved, the intestines and omentum, the pelvic organs, and the pelvic peritoneum, and the fœtus would go to the sixth or the seventh month, when it would die for lack of nutrition and become encysted. Then there were those cases in which the fœtus would undergo solidification, etc.

Dr. Hugo O. Pantzer, of Indianapolis, stated that he would like to add another symptom to the signs and symptoms given by Dr. Huggins which was invariably present, namely, a pulsating tumefaction on one side and not on the other. In rare instances this was attended with marked congestion or with tubal inflammation.

Dr. Charles L. Bonifield, of Cincinnati, stated that a great many women with ectopic gestation would get well without operation. It was the experience of every operator, who had operated on these cases, that after he had examined the specimen, he had wished he had left the patient alone, that nature would have cured her.

Dr. William H. Wathen, of Louisville, stated that, in looking over his cases, seen in private practice and in consultation, he found he had had approximately 150 of these cases, and of that number had seen but one patient who bled to death, and that occurred about twenty years ago when he was called and reached the patient just as a secondary hæmorrhage had caused her death. These patients would not bleed to death if the rupture was between the folds of the broad ligament, and seldom or never if it was a tubal abortion. They might have a rupture. They might have a rupture through the tube into the peritoneal cavity, provided a large vessel had ruptured. He thought if we took all the cases of ectopic pregnancy in which rupture had taken place during the last twelve months, we would find that not one out of twenty-five had bled to death from secondary hæmorrhage.

Dr. Walter B. Dorsett, of St. Louis, recalled a woman who, in a female hospital of which he had charge, ran up to the third floor on account of plastering that was going on below, fell, and died suddenly from a ruptured ectopic pregnancy. She had not been in the hospital more than two or three hours. The body was taken to the dead house, and a postmortem examination disclosed the abdomen full of blood. She had bled to death. This case occurred in 1887. These women would bleed to death more frequently than had been stated by Dr. Wathen.

Dr. A. B. Miller, of Syracuse, said the general practitioner in many instances was not called sufficiently early to make a diagnosis, and we

had heretofore attributed the late diagnoses in these cases to want of knowledge or education on his part, but the general practitioner was not so much to blame. We saw cases of our own where there had not been one symptom suggestive of ectopic pregnancy. These patients expressed themselves as feeling perfectly well, but in six hours thereafter they became desperately ill, showing that rupture had taken place. We could not always make an absolute diagnosis by the symptoms and physical findings.

Dr. D. C. Moriarty, of Saratoga Springs, believed the diagnosis of ectopic pregnancy was very much the same as in tuberculosis. If one made a diagnosis of tuberculosis early enough to save the life of the patient, he would have to do so in twenty per cent where it did not exist, consequently he thought it was well to operate on these cases of ectopic pregnancy early.

Dr. Miles F. Porter, of Fort Wayne, said it was not true, as Dr. Wathen had intimated, that none of these women died of hæmorrhage. All knew better than that. He would undertake to say, that he could find fifty men who would be able to operate on these cases practically as they came to them, and they would have a less death rate than another fifty men who practiced the finesse referred to, and that was the reason he was not in favor of this extreme diagnostic finesse.

Dr. William H. Humiston, of Cleveland, said he had had four cases in his experience on which he had had the opportunity of operating before rupture. As a rule, these patients did not consult a physician unless they were very nervous and were in pain, and that was why a great many of them were not diagnosed before rupture.

CESAREAN SECTION

Dr. William H. Humiston, of Cleveland, reported a case of multiple Cæsarean section, in which he resorted to both the high and low operations, and exhibited photographs of the mother and child.

A STUDY OF A PSEUDO-HERMAPHRODITE

Dr. H. S. Crossen, of St. Louis, presented a lantern slide study of a pseudo-hermaphrodite. This individual had dressed and lived as a female forty-two years, but as investigation demonstrated, was undoubtedly a male. The mistaken idea as to sex under which this patient had lived since infancy was due to a condition of hypospadias. The deformed male external genitals presented considerable resemblance to the female external genitalia. The case emphasized forcibly the fact that extreme care should be exercised to determine correctly the sex in every case of anomaly of the genitals in the newborn. The great majority of pseuod-hermaphrodites were really males, hence the rule was that in cases where the sex could not be positively determined in infancy the child should be treated as a male until unmistakable evidence of the opposite sex appeared.

RADIOGRAPHIC DIAGNOSIS OF GASTRIC AND DUODENAL LESIONS

Dr. Lewis Gregory Cole, of New York City, by invitation, presented a radiographic study of motor phenomena of the pyloric end of the stomach and duodenum with a view to the early diagnosis of carcinoma, ulcers, and adhesions in this region, which was illustrated by numerous lantern slides and cinematographic films. He said anatomically and physiologically the first portion of the duodenum had always been considered a part of the small intestine, but normally it was dilated into a triangular cap which surmounted the pylorus and corresponded in size and shape with the stomach, and had absolutely no resemblance to the small intestine. Its motor phenomena corresponded with that of the gastric peristalsis, and it was absolutely free from the small, rapid, peristaltic contractions of the remaining portion of the duodenum. It was probable that the chyme in this portion had not yet been neutralized by the intestinal and pancreatic secretions. This might account for the fact that ninety per cent of duodenal ulcers occurred in this portion. Personally, he considered the pyloric sphincter as a butler guarding the entrance to the intestines and allowing only that food that was recognized as properly prepared to be served to the intestine, and closing the door to prevent it from falling back into the stomach during diastole. He believed that the relative strength of the butler (the pyloric sphincter) to the cook in the kitchen (the peristaltic contraction of the stomach) was one of the most important factors in functional derangements of the gastrointestinal tract.

Dr. Cole projected on the screen four radiograms which showed the thumb marks of carcinoma before the patient was fairly in the grip of the deadly enemy.

The diagnosis of gastric carcinoma at an early stage was now accomplished in a very large percentage of cases, and the radiologist was justified either in making a negative diagnosis or stating with certainty that there was either a benign or malignant lesion which required an immediate operation.

Dr. Charles A. L. Reed, of Cincinnati, followed with remarks on displacements of the stomach and colon, their clinical significance, diagnostic features, and surgical treatment with report of cases illustrated by lantern slides.

DRAINAGE: THE ESSENTIAL ELEMENT IN THE SURGERY OF THE BILARY TRACT

Dr. Charles N. Smith, of Toledo, stated that cholecystectomy formerly was considered advisable, even necessary, in practically every case of hydrops and of empyema. In present-day practice, however, many a gall-bladder cut out from the biliary circuit and rendered practically functionless by a calculus or an inflammatory block in the cystic duct, could be restored anatomically and functionally by a drainage operation. Neither hydrops nor empyema necessarily called for the removal of the gall-bladder.

In those cases of hydrops resulting from occlusion of the cystic duct by a calculus, the gall-bladder generally could be restored to usefulness by removal of the stone and subsequent drainage, provided that the bladder walls had not been rendered extremely thin from overdistension by the imprisoned mucus. In practically all of those cases in which the extraction of the calculus was followed by the escape of bile from the duct, the gall-bladder should be drained rather than removed.

In a large proportion of the cases of empyema the gall-bladder could be saved and its function restored by drainage. The more acute the process and the shorter its duration, the greater the prospect of cure. When suppuration occurred in a gall-bladder which previously had been obstructed, the obstruction having existed for a long time, the performance of a cholecystectomy became a necessary procedure.

In several instances of perforation of a suppurating gall-bladder he had removed the calculus obstructing the cystic duct, drained the gall-bladder through the perforation, and had a complete restoration of function in every case.

Drainage was recognized as the one dependable procedure in the treatment of localized infections, and it must be looked upon as the essential element in the surgery of the gall-bladder and ducts. Natural drainage through the common duct into the intestine could not be depended on as a curative measure even in cases of mild infection. The distal opening of the common duct at the summit of the duodenal biliary papilla averaged, according to Opie, but one-tenth of an inch in diameter. While in its healthy state it afforded free exit for normal bile and pancreatic fluid, it was subject to encroachment upon its lumen by inflammatory swelling, greatly interfering with the rapidity and volume of the discharge through the orifice. The tenacious mucus so abundantly secreted during inflammation of the gall-bladder served to delay the onward flow and escape of bile and of itself became an obstructive agent. When an infection involved both the ducts and the gall-bladder, the mechanical interference from the swelling of the mucosa and the increased viscosity of the bile from the added mucus, resulted in a decided hindrance, if not a positive obstruction, to the escape of bile into the intestine.

As drainage was essential to the restoration of normal conditions within an infected biliary tract, and as it could not be attained through the natural channels with any degree of certainty, it devolved on surgery to establish and sufficiently maintain that drainage.

PRESIDENT'S ADDRESS

Dr. Herman E. Hayd, of Buffalo, reviewed the early scientific work of the association and referred to some of the epoch-making contributions of the members. He spoke of the evolution, growth, and development of the association. He made reference very feelingly to those Fellows who had died during the year, namely, Drs. Montgomery Linville, George E. Goodfellow, Manning Simons, William Warren Potter, C. C. Frederick, and Joseph Price.

President Hayd then reviewed the progress that had been made in the practice of obstetrics, in gynecology, and pelvic surgery, and said that during the past quarter of a century many great surgical questions and pathological problems had been settled. The treatment of displacements of the uterus was now definite and established. Plastic operations upon the cervix and perineum had been wonderfully successful and satisfactory. Ovariotomy, either for cystic or solid tumors of the ovary, had reached perfection in its technical management. The successful management of extrauterine pregnancy was a crowning tribute to specialized effort. The diseases of the liver and pancreas had been assiduously studied, and the results of timely and well directed surgery were most satisfactory and encouraging. Diseases of the bladder, ureters, and pelvis of the kidney had received the closest study and investigation by the modern specialist, but this class of work could only be carried on successfully by men especially trained and who had the time and desire to specialize in this careful and patient line of surgery.

He reviewed the work that had been done with reference to dealing with cancer, hernia, and post-operative adhesions.

The splendid results of modern medicine, and especially surgery and midwifery, had been in a very great measure accomplished through the efforts and assistance of the trained nurse, and no address would be complete before a body of men whose successful work was so dependent upon these conscientious and devoted women, unless it were illuminated by kind and appreciative reference to their services.

THE OBESE ABDOMINAL WALL

Dr. Francis Reder, St. Louis, stated that a large accumulation of fat upon the abdominal wall, such as was often found in women, was a distinct handicap to the surgeon in his work in removing a small fibroid tumor in an atrophic uterus, a retrocecal appendix, or a small gall-bladder tucked away in a deep fossa, with a stone in the cystic duct, or, still worse, a stone in the common duct. To obviate to some extent the embarrassment caused by excessive fat, he had followed during abdominal operations the suggestion of Dr. Kelly, who advised the excision of enough of the obese wall to facilitate intra-abdominal work, and from his limited experience gleaned from operations upon five patients, where masses of fat were removed, the intra-abdominal work was rendered less difficult; but he could also say that in few of the cases this fat caused considerable trouble which was induced by a late section. It did not require any particular skill to cut enough of the fat away about the field of operation to get a sufficient amount of room for easier work; but it did require some knowledge to ablate these masses of fat that no untoward consequences might arise. To prevent any post-operative sequelæ, a wedge-shaped mass of fat should be removed, the two incisions converging into one upon the fascial layer. This left no undermined surface as a receptacle for secretions. It did not matter how long the incision was, provided there was no extensive undermining of the fat layer. To be as accurate as possible in excising a wedge-shaped piece of fat, he had found it of service to first carry the straight incision across the abdomen down to the fascia, this incision disclosing the thickness of the fat. By placing the left hand into the incision and against the fat wall, he was able to guide more accurately the right hand in making the upper and lower flaps. After the ablation of the fat had been accomplished, the wound was covered with hot saline cloths, while the intra-abdominal work was being conducted. Fat removal was only to be recommended, however, when the mass of fat was a distinct obstacle to intra-abdominal work.

FACTORS ENTERING INTO THE MORTALITY OF ACUTE INTESTINAL (MECHANICAL) OBSTRUCTION

Dr. John Young Brown, of St. Louis, said that in considering the factors entering into the high mortality of acute intestinal obstruction, we must place at the head of the list late operation; second, treatment received before operation; third, the technique and time of the operation itself; fourth, the after treatment.

If we could impress upon those who first see such cases that delay meant disaster, and that a low mortality could only be gotten by an early operation, much good could be accomplished. However, this was not always possible. Not infrequently, although the condition was recognized by the attending physician, the family would refuse to consent to an immediate operation, or it might not be possible to get at once a surgeon competent to do this work. This being the case, it became the duty of those who taught to call attention to the harmful non-operable measures which were commonly employed, with the mistaken idea that they were beneficial. Foremost among such remedies he might mention cathartics. The symptoms in any case argued eloquently against their use. Nature invariably warned, by the retrograde peristalsis and the persistent vomiting, that she was making an effort to relieve the distended bowel above the block. Cathartics were as harmful in such cases as diuretics would be in a case of retention of urine due to an impermeable urethral stricture; yet we rarely saw a case come to operation that had not been given cathartics varying in strength from calomel to croton oil. If gastric lavage was used in the same routine manner, the profound toxæmias found in the cases of three and four days' duration would be far more infrequent. Morphin was another drug, the use of which could not be too strongly condemned. Regarding operations undertaken for the relief of such conditions, one must carefully guard against certain errors of omission and commission which added to their danger. As all such operations had for their purpose the relief of the block and second the removal from the bowel of as much as possible of its highly toxic septic contents, all such operations should be preceded by a careful washing of the stomach. Much toxic material could be removed in this manner and the danger of fecal drowning during the administration of the anæsthetic was greatly lessened.

The administration of the anæsthetic should always be entrusted to a careful anæsthetist. The operation should be executed as rapidly as possible. When the abdomen was opened, if the bowels were greatly distended, it was far safer to puncture in several places, liberating the gases and draining the bowel. Such small punctures could be rapidly closed with purse-string sutures. It is bad practice to forcibly handle distended bowel. In cases where resection was necessary, it was of prime importance to carefully drain the bowel above the block. The after treatment of such cases should consist of frequent stomach washing, the avoidance of opiates, and the use of salt solution, both by the rectum and under the skin.

PERSONAL OBSERVATIONS ON CANCER

Dr. J. Garland Sherrill, of Louisville, stated that in making a study of the cases of cancer occurring in his private practice, he had been able to follow 208 of these cases and trace them to the present time. Among these cases different portions of the body were affected. Of 19 abdominal operations 11 patients were living, 5 past the third year limit, while others had died in from 12 to 18 months. Of 12 vaginal operations, 4 patients were living from 3 to 12 years after the operation; 8 had recurrence, dying within 18 months.

Experimental work would seem to show that true cancer tumors might be produced by inoculation, as Langenbeck successfully inoculated a dog. This fact, studied in connection with other reports, and the further fact that metastasis in cases where local disease seemed to be entirely eradicated by operation, tended to lead one to the belief that carcinoma was due to an actively proliferating poison or entity; in other words, a living organism. Trauma and irritation were important factors in the determination of the site of a malignant neoplasm. His cases showed eight per cent in which trauma was noted, and eighteen per cent in which irritation was a factor. The results in his limited number of cases showed very readily the improvement in end results, when radical surgical treatment was applied early. This was the experience of practically all observers. To obtain the best results the patient must, first, present early for treatment; second, all suspicious growths should be removed. Keen and others went so far as to recommend the removal of all superficial growths lest they became malignant. The serum treatment of cancer had been disappointing. He had used the ascitic fluid of one patient, which was injected into her own tissues, with no marked benefit, although the disease seemed not to progress during the time of its employment. Fulguration had not accomplished much, nor had the X-ray done more than the knife or cautery could accomplish in a more thorough and certain way.

While it was true that a considerable number of cases of cancer were curable by radical surgical treatment, in a much larger percentage of cases they were hopeless before they came under observation. In view of the supposed infectious character of this disease, it was reasonable to urge the attendants of a cancer patient to avoid allowing the secretions to come in contact with the unbroken surface and to use the most stringent measures of cleanliness in the care of those patients. The room in which a cancer patient lived should be carefully disinfected. Such measures could result in no harm and might be of benefit in the prevention of the spread of the disease.

STERILIZED ANIMAL MEMBRANES IN SURGERY

Dr. Robert T. Morris, of New York City, stated that for some years he had been experimenting with the absorbable animal membranes in surgery, and now and then had found some point which he thought was new in connection with his work. One case worthy of report was that of a young man, who, at Princeton, in riding down a steep hill on his bicycle, met an automobile coming up, turned aside suddenly into a bank, and the handle of the bar of his bicycle tore five holes in the ileum. In this case there was so much contusion that he did not know where to resect. He washed out the blood and fecal matter, and decided temporarily to cover each opening with the Cargile membrane in a sort of mechanical way until the patient passed the period of shock, and then to consider the possibility of excision of bowel if the young man should live. The loops of perforated bowel were thrown about a small central drain, and a large dressing applied, and the young man not only lived, but he did not do any excision of bowel, and the patient was walking in thirty days without any fistula. That, he presumed, was due to the use of the Cargile membrane and to nothing else. He had not anticipated any such result in this case. It was a temporary procedure with a dying boy. Another point he had noticed with the Cargile membrane was that sometimes it did not undergo absorption rapidly. In an automobile accident, the patient having sustained a depressed fracture of the skull, he elevated the skull, separated the adhesions, and placed a large segment of

Cargile membrane between the dura and the cranium. In this case there was occasion to do an operation some eight months subsequently for some remaining adhesions, and this membrane had not undergone any change whatsoever so far as he could observe. It remained perfectly free and loose. It had prevented the formation of adhesions over the area he dressed and there were some supplemental adhesions about the periphery. This was an odd thing, and he did not know how to account for it. In many cases he had used the membrane for the prevention of recurrence of peritoneal adhesions as perhaps the favorite resource. In most cases now, in which he had occasion to separate extensive peritoneal adhesions, he depended upon placing a sheet of this sterilized animal membrane over the area from which adhesions had been separated for the purpose of preventing a mechanical obstacle to the recurrence of adhesions.

THE RELATION WE BEAR TO OUR PATIENTS AND WHAT USE SHALL WE MAKE OF KNOWLEDGE OF THE EVIL EFFECTS OF VENEREAL DISEASE

DR. ALBERT VANDER VEER, of Albany, referred to the early work in the life of the association regarding pus in the pelvis, and especially to the work of the late Dr. Joseph Price, and the earnestness with which the Fellows investigated this subject, a large percentage of the cases being directly traceable to gonorrhœal infection. He made a plea for placing before the public more clearly our knowledge of syphilis and gonorrhœa. In this manner he believed much suffering would be prevented. Parents were desirous of obtaining information on this subject. Young people were entitled to know more regarding their reproductive organs and the evils that may follow infectious diseases. While much was being accomplished at the present time in the literature presented by our able representative publications, yet he felt that as a profession we could accomplish more much than we had in the past.

METHODS OF SKIN STERILIZATION

DR. JOHN E. CANNADY, Charleston, West Virginia, reviewed the history of the iodin methods of skin sterilization. The method he employed was the fractional one. The skin was carefully shaved and cleansed with soap, cotton sponges, and hot water, followed by alcohol. After the skin had dried it was painted with a two per cent solution of iodin and alcohol. This was done the evening of the day before the operation, and when the skin had dried a sterile gauze dressing was applied. Early the next morning the skin of the operation site was again painted and the dressing reapplied. Lastly, while the patient was being anæsthetized the skin was painted for the third time. The results had been uniformly good. The scrubbing brush and the bichlorid compress were no longer used on the patient. The laboratory findings of Kinnaman showed that iodin was at least one hundred times more powerful a bactericidal agent than bichlorid.

SOME FACTORS IN OPERATIVE TECHNIQUE AND MANAGEMENT WHICH MAKE FOR SUCCESS OR FAILURE

DR. WALTER B. CHASE, of Brooklyn, contributed a paper on this subject in which he emphasized the following points: 1. Ascertain with all possible accuracy any variation from the normal standards of health, functional or organic. This included a precise knowledge of any involvement due to coexisting disease of the circulatory, respiratory, renal, hepatic, digestive, and nervous systems, apart from the special surgical aspect of the case. 2. That the power of hereditary longevity, as related to existence, so often otherwise unexplainable on the chances of recovery after operation, could not be gainsaid. Seek out with scrupulous care the previous history of the patient suffering from serious disease or accident. If such had recovered with little or no impairment, other things being equal, they were safe subjects for operations. He had recently had a most remarkable demonstration of this truth not yet reported where adverse circumstances would ordinarily have forbidden operative interference. 3. The surroundings of the patient must be inquired into. If there was vital impairment, save in imperative cases, one should take all the time needed in which there should be the best attainable explanation of the lowered vitality of the patient. 4. Too many specialists, having little or no knowledge as general practitioners, fell into the grievous error of operating for appendicitis when the ailment was typhoid fever, for supposed intestinal obstruction in the presence of fecal impaction, or for cholelithiasis where only cholecystitis was present. It was safer and wiser to admit a lack of knowledge on diagnostic points than to act on insufficient data. 5. The emotional nature could not be ignored. The influence of hope and fear, the most powerful motives in the human heart, must be reckoned with. They might be potential in the domain of surgical procedure. The confidence of the patient must be had in full measure, not in diagnosis alone, but as related to results. These neurotic cases must

be saved from the depressing influence of needless delay, when decision had been made for operation. Their knowledge of unfavorable factors must be guarded and self-reliance strengthened. Here might be a legitimate field for the hypnotist. 6. The evil of procrastination on the part of the operator when the plainest evidence demanded immediate operation, was a matter of profound regret and was open to severe criticism. 7. The imperative need of skilled and experienced anæsthetists. If the mortality resulting wholly or in part from shock and hypernarcosis from the excessive and unskillful use of anæsthetics were known and appreciated, there would be inaugurated new methods in hospitals and private operations, and college and hospital teaching would undergo radical changes. No matter who the operator or where his work was done, those entrusted to the administration of the anæsthetic should be the best and not those least qualified for such important work. When such standards of requirement were enforced, fewer deaths from causes not well defined would mar hospital and private statistics.

PREVENTION OF SHOCK

DR. J. H. CARSTENS, Detroit, contributed a paper on this subject in which he drew the following conclusions: 1. By simplicity and tact in management before operation, much shock can be prevented. 2. The surgeon should have everything ready in the operating room, and the anæsthetic should be started immediately. 3. All the necessary ligatures and instruments should be at hand, so that there need be no delay during the operation. 4. One should analyze the case thoroughly beforehand, so that he may know exactly what he is going to do, and how he is going to do it, and what complications might arise. 5. Two quarts of salt solution in the from of an enema should be given, or given hypodermically as soon as the operation is finished. 6. The patient should be kept free from pain for twenty-four hours after the operation.

OFFICERS

The following officers were elected for the ensuing year: President, Dr. X. O. Werder, Pittsburg, Pennsylvania; First Vice-President, Dr. Louis Frank, Louisville, Kentucky; Second Vice-President, Dr. Magnus A. Tate, Cincinnati, Ohio; Secretary, Dr. E. Gustav Zinke, Cincinnati, Ohio; Treasurer, Dr. Herman E. Hayd, Buffalo, New York.

Toledo, Ohio, was selected as the place for holding the next annual meeting; time, September 17, 18, and 19, 1912.

WASHINGTON SURGICAL SOCIETY

THE THIRD REGULAR MEETING HELD FRIDAY, JUNE 16, 1911, THE PRESIDENT, DR. GEORGE TULLY VAUGHAN, IN THE CHAIR

FURUNCULOSIS AND RETENTION OF URINE

DR. HAGNER mentioned a case of a boy recently admitted to the hospital because of retention of urine which had occurred five days before. He had had several attacks of furunculosis. The lifting of a weight had been followed by retention and fever. Ureteral catheterization showed normal urine. There was some pain and swelling in the region of the left kidney and about 6 ounces of pus were evacuated from around the lower pole, the staphylococcus aureus being recovered in pure culture. Blood cultures were negative.

DR. SOWERS mentioned a case similar to Dr. Hagner's; a woman, age 60, had been subject to attacks of furunculosis and was very anæmic. Following the development of local symptoms a quart of pus, containing the staphylococcus albus, was evacuated; the organism was also found in the urine and in the blood. In this case a vaccine helped considerably, but the patient finally died of pyemia.

OBSTRUCTION DUE TO MECKEL'S DIVERTICULUM

DR. HOOE reported a case of a child 10 years old who for two days had abdominal pain and some nausea. A cathartic and an enema were given which produced merely a large colonic movement. At operation, 43 hours after beginning of attack, obstruction was found due to Meckel's diverticulum; 30 inches of small intestine and part of the cecum were resected.

DR. WELLINGTON had seen four cases of disease of diverticulum in the past four years; one was

chronic with a discharge of mucus from the umbilicus; the second was one of intestinal obstruction; the third was of acute inflammation, resembling appendicitis; the fourth was local inflammation caused by the lodgment of a bone in the diverticulum, the bone being identified as having been swallowed a considerable time prior to the onset of symptoms.

DR. E. P. MAGRUDER then read the paper of the evening on "Volvulus." (See page 602.)

DR. W. P. CARR thought the paper admirable though he disagreed in two or three small details, — for instance, he thought the gridiron incision rather a thing of the past, the incision through sheath of the rectus being much better. The difficulty of diagnosis in volvulus is great; many years ago he saw six cases in one summer with symptoms of volvulus; three cases, apparently mild, recovered without operation; one case especially he remembered of a drug clerk who took cathartics and was finally relieved by an injection causing a small movement; the fourth case was operated upon and died; the fifth case refused operation and died; the last case died during operation, practically drowned in a large amount of vomited fluid. The suddenness of dissolution in some of these cases is remarkable. He emphasized the necessity for early operation whenever strong suspicion exists. In the after treatment he agreed with Dr. Magruder, except that morphine may be used in the first twelve hours to good advantage and without any bad effects.

DR. MAGEE mentioned the fact that resection of the large bowel gave generally more favorable results than in the small bowel; he mentioned a desperate case of resection of twenty inches of the colon recovering with few symptoms.

DR. KERR spoke of the quiescent stage which is so often seen in early cases of obstruction and which may be so deceptive and cause the surgeon to get them only in the stage of collapse. He agreed with Dr. Carr in regard to the use of morphine in after treatment.

DR. I. S. STONE mentioned a case in which powerful purgatives had been used and which did not reach complete obstruction for six days. Operation was refused until obstruction became complete; then a twist and a half was found in large bowel and a side to side anastomosis was done without resection; vomiting persisted, but the patient was finally relieved by the use of eserine. He thinks volvulus more characterized by pain than other forms of obstruction; he mentioned the necessity of emptying the stomach prior to operation in these cases.

DR. HAGNER had seen cases saved by the use of an artificial anus when resection could not be employed.

DR. VAUGHAN had been impressed most by the cases of torsion of the mesentery with volvulus which may be rapidly fatal. We may get a twist of the sigmoid without gangrene or we may get gangrene of the mesentery. He cited a case of a man with an inguinal hernia, easily reducible, who had persistent vomiting as a chief symptom; an operation with reference to the hernia was decided upon, but following profuse vomiting the patient died. A postmortem showed twenty-five feet of gangrenous mesentery and bowel. A second case showed rotation of mesentery supplying twenty feet of intestine. These cases of torsion of practically the entire mesentery may not give intestinal obstruction and may not require resection; after twenty-four hours there may be a large quantity of free fluid in the abdomen. He does not agree with Dr. Magruder in regard to the necessity for the Fowler position. A man in the horizontal position will drain to the pelvis and be much more comfortable; the importance of diaphragmatic absorption is probably exaggerated. He believes the intermittent use of salt solution just as good as the continuous and he uses a strong solution of 1 or 2 per cent. He uses morphine in after treatment.

DR. MAGRUDER in closing stated that the gridiron incision was made because a diagnosis of probable appendicitis had been made. He thinks that more than ten feet of intestine may be removed with safety if necessary. He cannot agree that the use of morphine is advisable and thinks ileus can be controlled by the use of bromides. As a rule he thinks the Fowler's position best, though in some cases the Trendelenburg is to be preferred; the extreme Fowler is unnecessary and uncomfortable. He thinks the continuous or intermittent salt solution of about the same effect, but prefers, perhaps, the continuous 40 drop to the minute method as probably less disturbing to the patient and therefore most effective.

BOOK REVIEWS

GYNÉCOLOGIE OPÉRATOIRE. By Henri Hartmann. Paris: G. Steinheil, 1911.

After a perusal of this large volume one is impressed chiefly with two features. First, the author reveals an unusual sense of proportion in describing the various operative procedures, giving, as compared with American texts, much space and detail to the plastic and vaginal operations and relatively less to the more brilliant abdominal work. Second, M. Hartmann seems to be satisfied with a description of the operative procedures, going little, and sometimes not at all, into considerations of indications for or results of operations. And, further, in presenting different methods of dealing with a given condition their relative merits are not discussed, and at times he almost declines to express his own preference, as where he states in describing the closure of the abdominal incision, that the method employed is of little moment, it sufficing that the suture material be aseptic and that like tissues be brought into contact with one another. In this connection it should be stated that M. Hartmann, surgeon at the hospital Larboisiere, published a volume only last year dealing with the surgery of the male genito-urinary organs. This may explain in part his breadth of view and catholicity of statement, since all the way through the present work reads as if from a pen of the general surgeon. Hence, the gynecologist finds some things to learn, much to interest him, and is surprised at the absence or curtailment of certain features long held essential to a complete text in this phase of special surgery.

After a chapter of unusual brevity devoted to the clinical examination and history of the patient, attention is directed to "petite gynecologie" wherein the douche, local medical application, dilatation, atmokausis, the pessary, and curettage is considered. Electro-therapeutics is discussed in a separate chapter with kinestherapy or hydrotherapy. Following are sections devoted to operations on the external genitalia, and vagina, wherein less space is given to tumors than to plastic work in stenosis or atresia. Here, while older operations for the formation of a vaginal canal in complete atresia are described with some detail, but two short paragraphs are used in mention of the modern intestinal transplantation method.

An interesting section is that given over to plastic repair of the perineum and vagina, well worth careful study. In discussing prophylaxis, the second stage of labor is treated in such a manner quite satisfactory to the obstetrician and is excellently illustrated, a feature which would be taken for granted in the English text. Both the Emmett and the flap-splitting operations, classed as "colpoperineorraphie," are described and illustrated, though, certain of other less known procedures are without the advantage of pictures.

Vaginal myomectomy by morcellation, and the various colpotomy procedures, including vaginal fixation of the uterus are treated more conventionally, though as always in an interesting manner. Later on in "coeliotomie abdominale," the almost undisputed advantage of the abdominal route over the vaginal for myomectomy is not brought out.

The bisection of the uterus in vaginal hysterectomy seems to be the preferred operation, though various other procedures are mentioned. An entire but short chapter is devoted to the paravaginal hysterectomy of Schuchardt.

Abdominal operations constitute the third portion of the volume, a mere matter of one hundred fifty pages. Drainage is in favor, even where hæmostasis is imperfect, a large rubber tube in the lower angle of the wound being preferable to the vaginal route. Complications are discussed in a manner almost annoying, shock being given fourteen lines, intestinal occlusion, nine lines, acute gastric dilatation, six lines, and urinary retention, three lines. Hysterectomy is unusually well illustrated, this being especially the case in bringing out the various steps in the Wertheim procedure for carcinoma. Here, too, M. Hartmann does come out definitely and briefly against the vaginal route in operating for malignancy. Conservative work on the appendages is in favor with the author, the tube especially being saved even in part wherever possible. Uterine fixation and the various round ligament shortenings are described with no preference as to method.

The treatment of metritis is based on a clinical classification, as is that of inflammation of the appendages. Hence, various conservative methods are described, with ablation as the radical surgical measure of *ressort dernier*. Likewise a palliative treatment is found for fibromyomata of the uterus, removal on diagnosis not being advocated. This is particularly emphasized where pregnancy coexists. Even in extrauterine pregnancy, after the fifth month and the fœtus living, conservative treatment is advocated. To this last subject is given four pages, but no illustrations. Amenorrhœa, menorrhagia and metrorrhagia, dysmenorrhœa, the menopause and sterility are the subjects in conclusion of part IV.

The final portion of this work is given over to the urinary tract. For cystoscopy the combined lithotomy-Trendelenburg posture is used. A consideration of vesical fistulæ and their operative repair occupies the final chapter.

In general, little but praise can be expressed for

the detail of M. Hartmann's volume. Differing from our views in some general considerations and presenting his material in a manner so concise as to be often incomplete, as has been intimated, his work as a text necessarily must be of most value to the experienced surgeon. The student would look in vain for some things he should know while the gynecologist would always find the book of more than passing interest, indeed, of positive value.

CAREY CULBERTSON.

DISLOCATIONS AND JOINT FRACTURES. By Frederic J. Cotton, A.M., M.D. Philadelphia and London: W. B. Saunders Co., 1910.

The author's plan was to avoid cumbersome references to authorities as such, using such notes only to verify the facts therein stated. The illustrations also are not indexed by number, the object being to make them a more integral part of the text and as most of them are from drawings by the author himself or from photographs and skiagraphs of cases which were under his own observation, the text partakes of a more personal nature. Only a few conclusions as to treatment, however, are personal, as most of them are shared by many surgeons and constitute generally accepted rules of treatment.

The author does not believe that in a certain case of fracture or dislocation some certain splint or method of reduction should be used, but, that after studying the case as it progresses one should endeavor to get the best results by employment of whatever means at hand and the text relating the different conditions most of which occurred in clinical practice tends toward this end.

The book deals not only with injuries and dislocations of the bony skeleton but of contiguous soft parts, and the relation of such injuries to the general organism. The book is very comprehensive, clearly and concisely written, and will be of practical value to the general practitioner as well as the surgeon.

H. A. POTTS.

INEBRIETY. By T. D. Crothers, M.D. Cincinnati: Harvey Publishing Co., 1911.

The author of this work has certainly lost his opportunity of writing a treatise on inebriety. His book rightly named would be:—"My Views on Inebriety — a Psychosis." The text frequently contradicts itself and is indefinite and misleading.

He goes into great detail regarding the underlying factors of the cause of inebriety, taking it up from a psychological basis. Only a very brief chapter is devoted to the interesting topic of pathology. In a chapter devoted to delirium tremens he makes the daring statement:—"The prognosis of delirium tremens is always good." Medicinal treatment is mentioned only to condemn it. Special institutes, such as pretend to cure drunkenness, are ridiculed. In the author's mind baths of various kinds, and suggestion, are the all important factors in the treatment of inebriety.

As a résumé, the work is a personal deduction on inebriety which is decidedly averse to the general idea of this condition.

J. A. WOLFER.

LANDMARKS AND SURFACE MARKINGS OF THE HUMAN BODY. By L. Bathe Rawling, M. B., B. C., F. R. C. S. Fourth Edition. New York: Paul B. Hoeber, 1911.

A very brief work in which the author takes up merely the viscera and important structures of the human body, as they may be mapped out by surface markings. The text consists essentially of a description of the illustrations which are exceptionally good.

The chapter on cranial topography is especially well taken up — brief yet thorough, and by studying the text with the illustrations there can be no doubt in the reader's mind regarding the localization of the various brain centers.

The author has accomplished what he intended to — to place before the profession not a text on surgery or applied anatomy, but a work simply giving the reader a description of the external landmarks in relation to the internal structures which will enable him to locate the latter to a certain degree of precision.

In an appendix he gives the length of various passages and tubes, the weight of some of the organs, and the time and centers of ossification of the bones of the extremities.

JOHN A. WOLFER.

GONORRHŒA IN THE MALE. A Practical Guide to its Treatment. By Abr. L. Wolbarst, M. D. New York: The International Journal of Surgery Co., 1911.

A very simply written book laying plainly before the reader the facts as one encounters them. He emphasizes the two and three glass tests with irrigation of the urethra in diagnosis as to the extent of the infection which should at all times be known to the physician, and the treatment applied accordingly. He further states that most men treat this condition too heroically and consequently precipitate complications and sequelæ which could easily be avoided by more careful and deliberate treatment. In chronic cases he again emphasizes the point that it is absolutely essential to locate the site of infection, whether in the anterior urethra, the posterior urethra, the prostate, the seminal vesicles, or the bladder, or any combination, and to direct the treatment to that location.

He makes a strong appeal to the reader to be cautious in telling a patient that he is cured of gonorrhœa, and states that only after repeated negative microscopical examinations should one say that his patient is probably cured.

JOHN A. WOLFER.

PRACTICE OF SURGERY. By James Gregory Mumford, M.D. Philadelphia and London: W. B. Saunders Co., 1910.

This volume of 1,000 pages is rather a treatise on clinical surgery as the author has omitted much of

the principles of surgery except as they have to deal with cases in hand and has confined the text to such conditions as are seen in daily practice, preference being given to the more common and important surgical diseases. Time was when the professor of surgery covered the whole field in a short time but now specialists in many kindred branches (pathology, bacteriology, serum therapy, etc.) must also teach the student the vital relation of these various subjects to surgical practice.

In view of these facts the author has seen fit to condense the subject bringing out the more important and more frequent surgical conditions as they arise in general surgical practice.

The author's rich experience and observation in clinical surgery has enabled him to present in a clear and concise manner this valuable contribution to diagnosis and treatment, useful alike to both student and practitioner. H. A. POTTS.

THE TREATMENT OF THE DISEASES OF WOMEN. J. Veit. Berlin: S. Karger, 1911.

This volume by Veit, consisting of 244 pages, should find a welcome from every gynecologist, and will be a great benefit to the general practitioner in his daily work.

The author has selected from the great number of treatments both medical and operative those which in his opinion are best suited to the case in hand. His theories and practice are sound and are founded upon reliable pathologic data.

In the first part of the work, Veit discusses the work that can be done in the office or home and rescues from a fast disappearing routine of local treatment those methods that are of real value.

In the second part, various gynecological diseases and their treatment are discussed, such as the technique of laparotomy, drainage of the abdomen, preparatory and after treatment of laparotomy, puncture and incision of the vagina, anterior hysterotomy, and anæsthesia.

A special portion treats of the diseases of the external and internal genitalia, sexual neurasthenia, sterility, peritonitis, parametritis, diseases of the ureters, bladder and urethra, and finally urogenital fistulæ.

Taking into account Veit's extended experience, this work becomes doubly valuable. The effort to discuss special topics thoroughly rather than to run the entire gamut of diseases and treat each indifferently is greatly to be commended.

HERBERT M. STOWE.

JOINT TUBERCULOSIS. By Leonard W. Ely, M. D. New York: William Wood and Company.

Both the author and the publisher are to be congratulated upon this volume; the author because of the excellent résumé he has given the subject, in addition to the report of his own investigations which have been carried on in a painstaking and scientific manner; and the publisher because of the excellent way in which the book is published. The book shows a conspicuous absence of the usual padding which appears in many books; every word can be read with profit. It is a volume which should be in the hands of every one having to deal with tuberculous subjects. Whether or not the assumptions of Dr. Ely are based upon sound pathology or not must be left to the future to decide. They at least give him a working hypothesis which certainly is as satisfactory as any other we have at the present time, and at least offers a basis for future scientific investigations and observations in these subjects.

It is based upon the assumption that the lymphocytes may not be a defensive organism but a natural food for the tubercle bacillus and that when the bacillus is deprived of these the process becomes cured. Therefore, an operation which causes the disappearance of the red, cellular, or lymphoid marrow in the ends of the bone, shuts off the food supply of the bacillus. He lays particular stress upon two principles in treatment which he believes to be essential; that the joint should be deprived of its function and secondary infection should be prevented. To produce the first of these, emphasis is laid upon the fact that it is not necessary to excise a large portion of the bone but simply sufficient to allow a bony ankylosis with ultimate canalization.

His reasoning throughout is safe and sane. Besides a general discussion of the subject of tuberculosis of the joints he takes up in detail tuberculosis of the various individual joints in the body with practical suggestions as to their treatment.

SYMPTOMATIC AND REGIONAL THERAPEUTICS. By George H. Hoxie. New York and London: D. Appleton & Co., 1910.

This volume holds strictly to its title and seems in many ways to be peculiarly practical. Under symtomatic treatment pain, fever, itching, insomnia, constipation, vomiting, cough, obesity, emaciation, etc., are treated in detail and every phase of the treatment is looked into. Following this is a chapter on treatments of inflammations, then each of the main systems of the body is taken up separately and exhausted. Much attention is paid to climatic treatment in tuberculosis. The newer methods of treatment of the insane are carefully recorded. In taking up the metabolic diseases several pages are given to the tabulation of the composition of various foods. The book is terminated by a concise, but thorough, record of the various drugs in alphabetical order among which are included the various mineral waters with their per centage composition. CAREY CULBERTSON.

CORRESPONDENCE

A PSEUDOHERMAPHRODITE

EDITOR SURGERY, GYNECOLOGY AND OBSTETRICS: I have received so many inquiries concerning the sex of the pseudohermaphrodite whose history I reported in your journal that I herewith present the paragraph concerning this which was omitted.

A very interesting sociological problem presented itself in our case. As gleaned from the history, this patient was in reality a male, but had throughout life been classed as a woman. After an extended conference with the family physician and a relative of the patient, it was deemed wiser to let this individual remain ignorant of the state of affairs. Were he made cognizant of this condition it would be incumbent on him to dress as a male. This would of course necessitate his relinquishing his work, which has been of a character only performed by females and in a factory where only women are employed. On account of the necessary explanation that would follow he would at once be ostracized by his former female associates, and it was already too late in life with his handicaps to attempt to make his way as a man. After viewing the subject from all points it was thought wiser to leave the social relations exactly as they were. Had it not been for the strangulated hernia we would doubtless never have detected this abnormality.

THOMAS S. CULLEN, M. B.

BALTIMORE, MD.

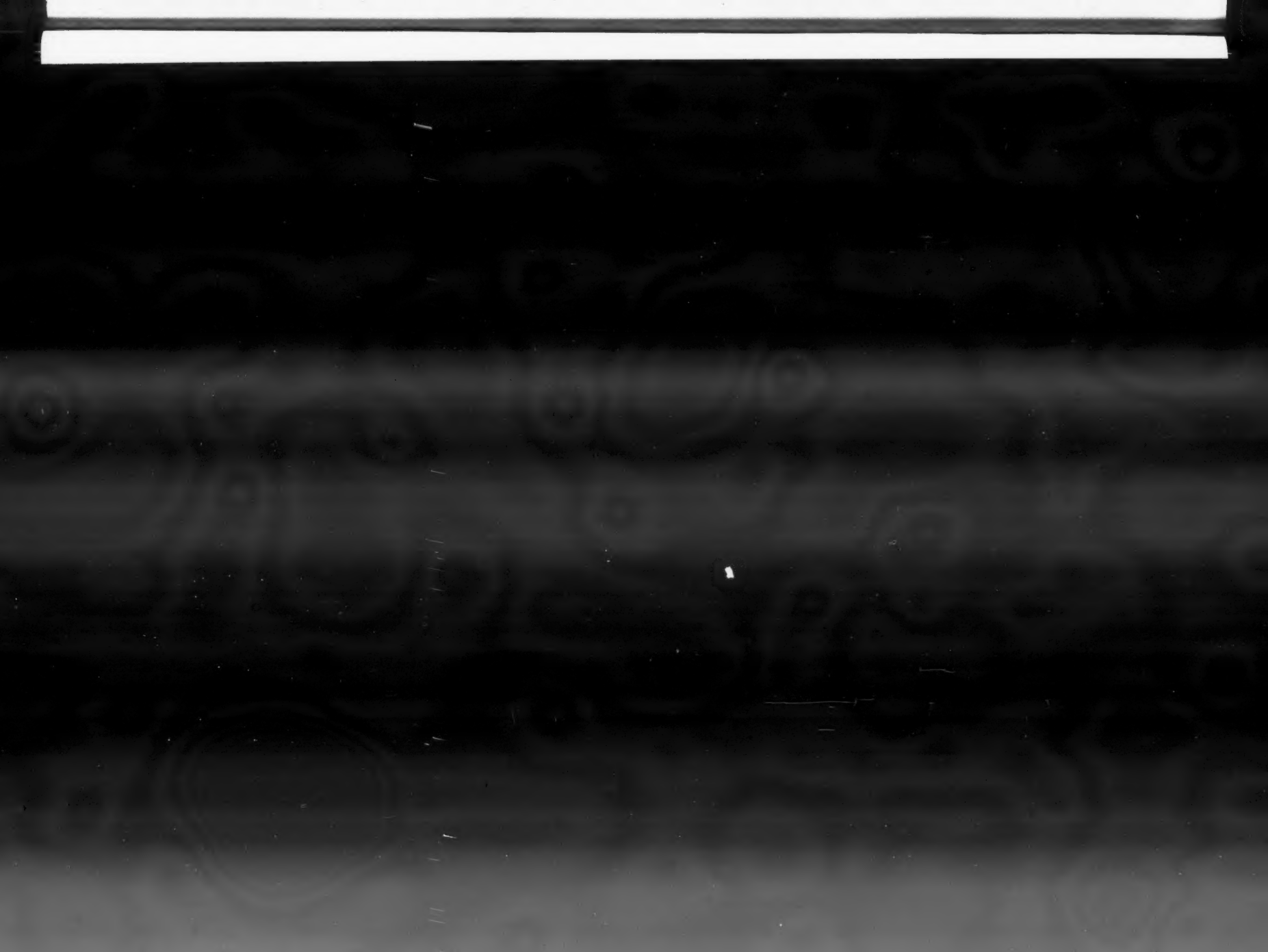
DUDLEY'S OPERATION

EDITOR SURGERY, GYNECOLOGY AND OBSTETRICS: Dr. Brickner's able article on Dudley's operation calls for nothing but commendation. I would suggest a method of suturing which to me presents the following advantages: First, it is expeditious; second, it is very simple; third, it requires but one needle; fourth, the results are satisfactory.

I use linen thread and boil it with the instruments. After the incision is made and its lips separated the result is a triangle, the apex of which let us call A, and the right and left lower angles B and C respectively. Use a self-threading needle, draw the thread through the eye so that both ends are of equal length. Then thrust the needle through the apex or A, from vaginal side to endometrial side and pull through for (say) six inches. You will have two ends hanging down the vaginal side and the needle in a loop on the endometrial side. Cut your loop near the needle, freeing said needle. Now thread one vaginal end by pushing the eye against it and thrust the needle through B or the lower angle of your imaginary triangle. Do the same with the other vaginal thread through the opposite angle or C. Then knot one free end at A with that through B, and the other free end at A with that through C. This seems crude in explanation but a needle and a piece of cloth will make everything quite clear with a few minutes practice. Take a piece of cloth, make an incision partly through it. Spread the free ends of that incision and unite them to the upper terminus. Then I am sure it will be readily seen what a simple way of suturing I am suggesting. In fact, it is so very simple that I doubt if it is original with me, though I am assured that it is so.

DOUGLAS H. STEWART, M. D.

NEW YORK CITY, N. Y.



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Volume XIII DECEMBER, 1911 Number 6

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Good Books You Need See Page 13

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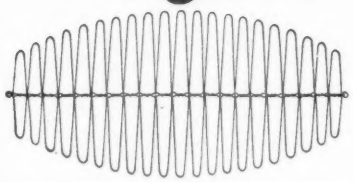

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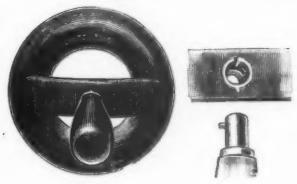

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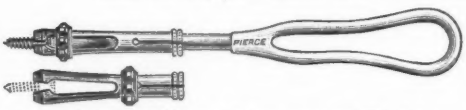

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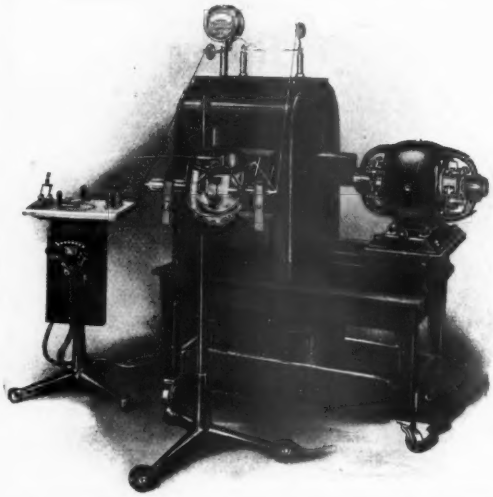

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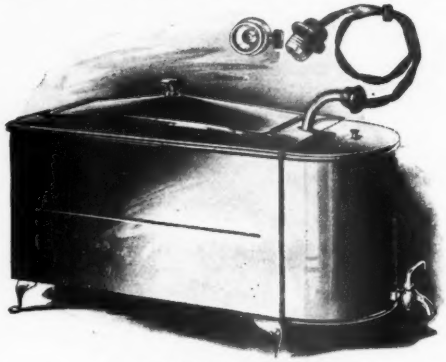

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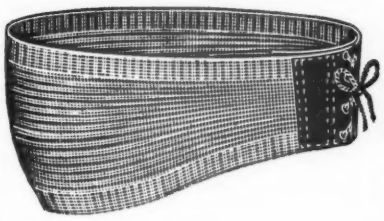

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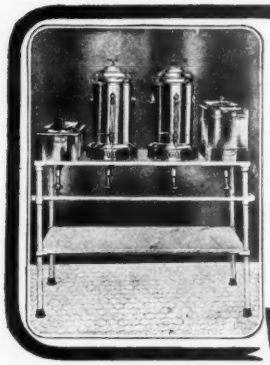

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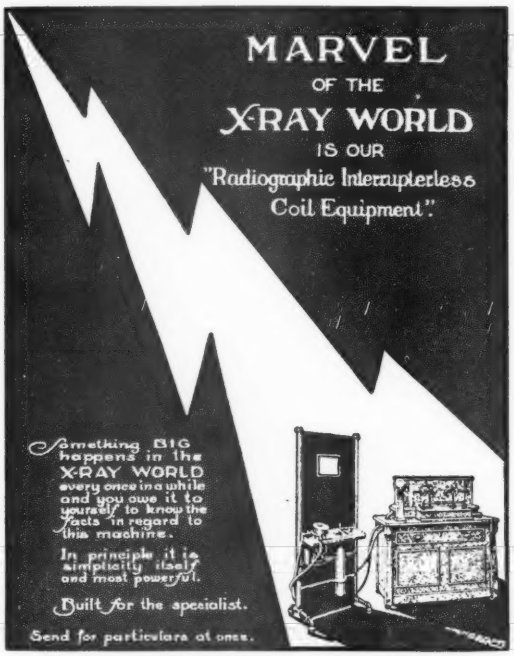
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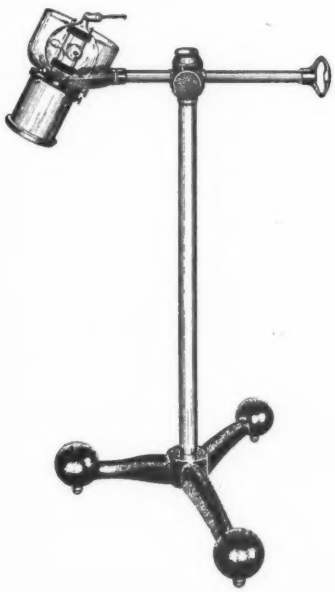

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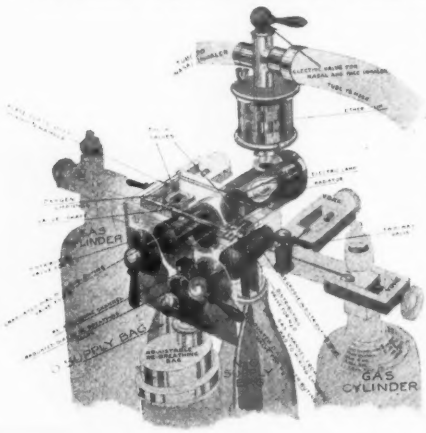

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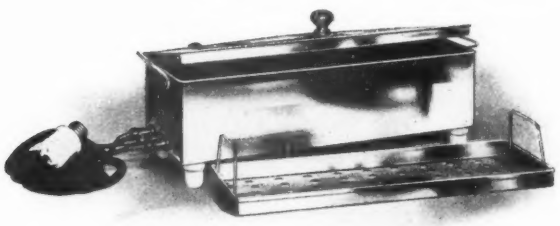

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.....ALEXIS CARREL, M. D., New York City

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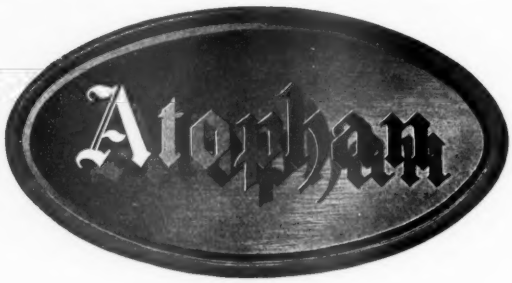

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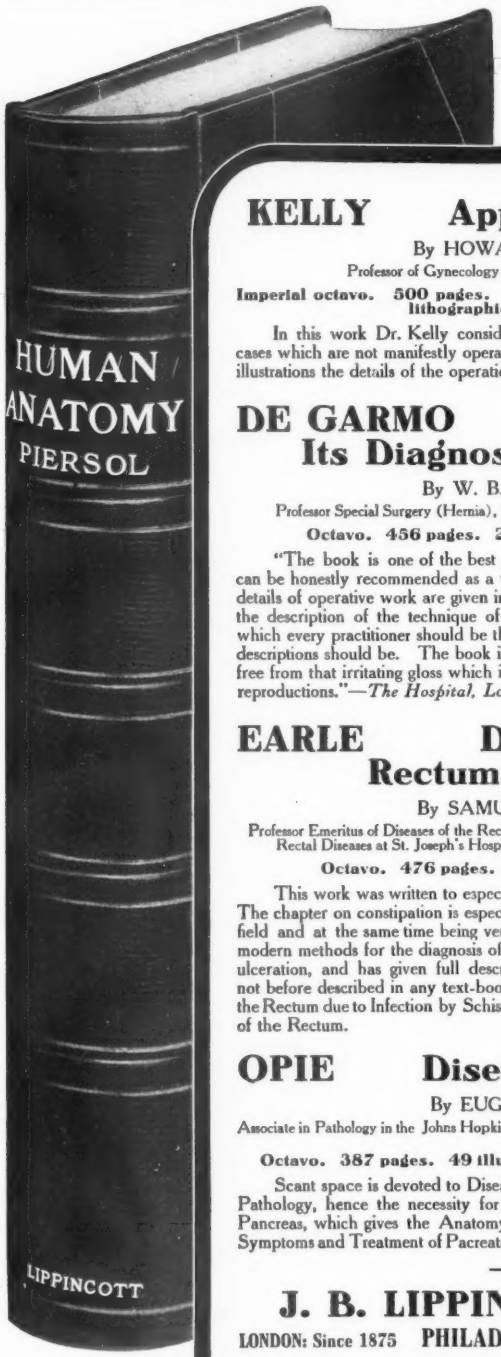

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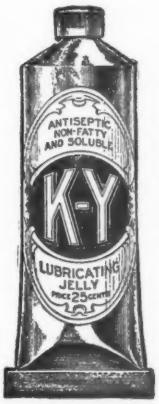

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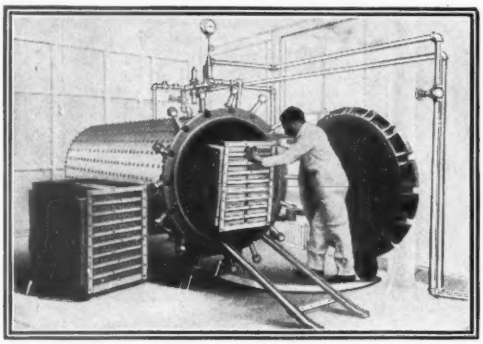

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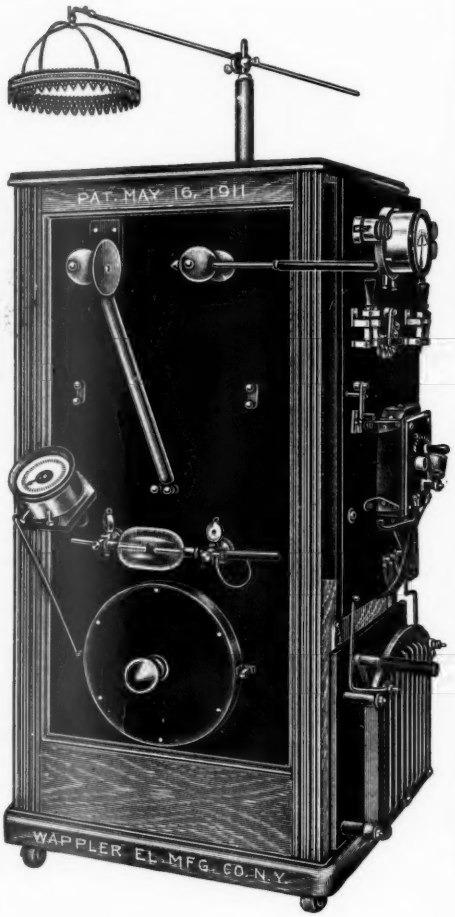

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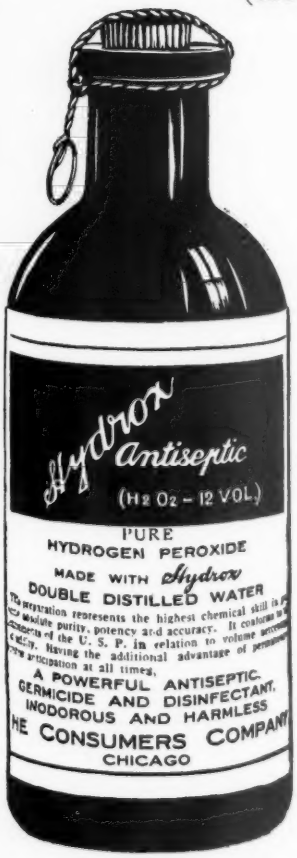

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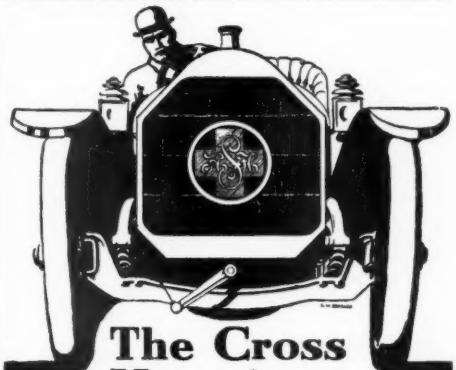

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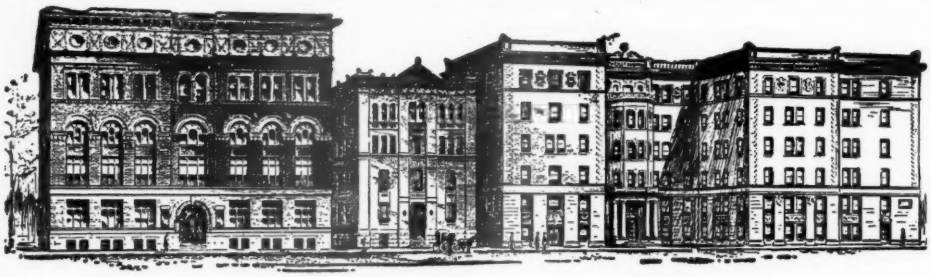

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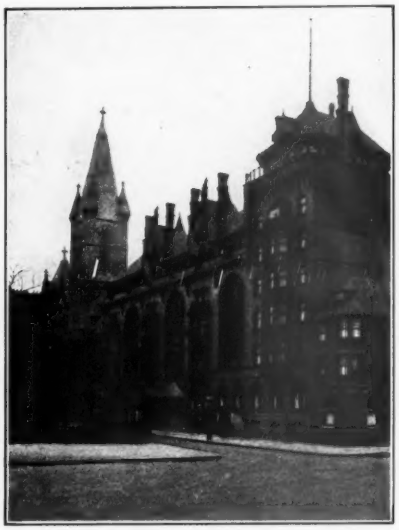

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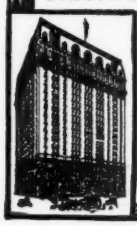

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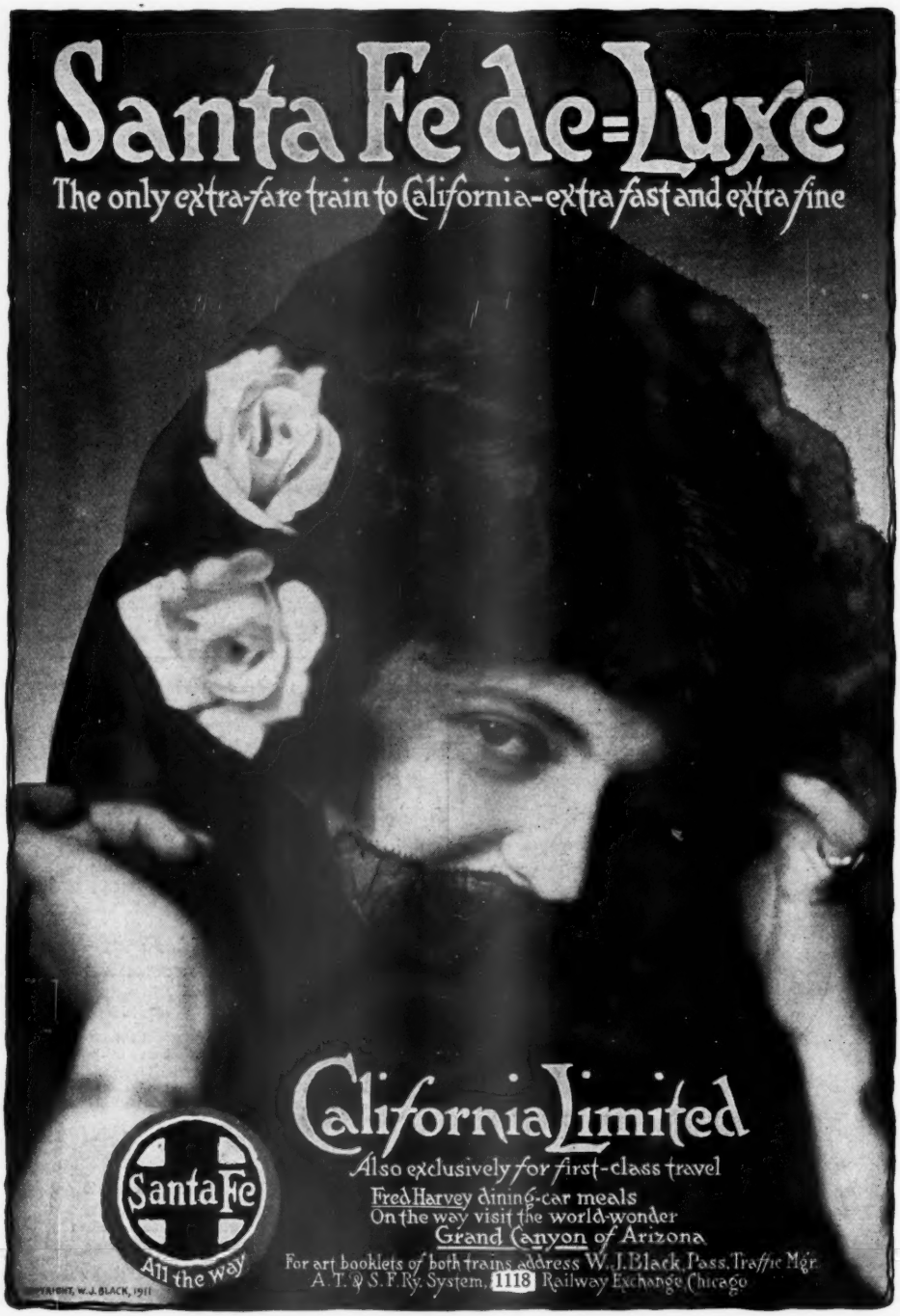
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The value of a liquid extract of Malt and Hops (when properly prepared) to increase not only the amount of milk but especially the fat content, is universally recognized.

But it **must be** real Extract of Malt and Hops, not a cheap dark beer, masquerading as such.

It should be

ANHEUSER-BUSCH'S

Malt-Nutrine

TRADE MARK.

which is the STANDARD MEDICINAL MALT preparation of its class.

MALT NUTRINE is a food-tonic—not a beverage.

It is the product of skill and experience in the chemistry of brewing.

Malt Nutrine is intended for Physicians' Prescriptions.

It stimulates appetite, improves digestion, nourishes the tissues, and increases the quantity and quality of milk.

Pronounced by the U. S. Revenue Department a
PURE MALT PRODUCT
and not an Alcoholic Beverage

Sold by all Druggists

Anheuser-Busch :: Saint Louis

Visitors to St. Louis are cordially invited to inspect our plant

Lecithol is indicated in Rickets, Anemia, Chlorosis, Tuberculosis and nerve disorders.

Elixir of Enzymes is an aid to digestion and a good vehicle for the iodids, bromids, etc.

Extract of Red Bone Marrow is recommended in cases where an increase in hemoglobin and red corpuscles is desired.

Thyroid, Thymus, Spleen, Suprarenal, Pituitary, Parathyroid and other substances under our label are pure and are made from fresh material.

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In Pulmonary Troubles

In prescribing "Horlick's" in the treatment of Pneumonia, Bronchitis, Tuberculosis, etc., the patient receives the benefit of pure, rich milk and an extract of malted grain, in a concentrated, partially predigested, readily assimilated form, thus obtaining the maximum of nutrition with the least tax upon the digestive organs.

Indicated, also, in Typhoid, Gastro-Intestinal diseases, in convalescence, as well as in the feeding of Infants and delicate children.

A glassful, taken hot upon retiring, proves an excellent "Night Cap" for the physician, when tired out or "chilled through."

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